THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 643.] LONDON, SEPTEMBER 7, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

PROUD'S
SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
SCRUBBERS FITTED WITH MR. LIVESEY'S BOARDS AT MODERATE COST.
BROOKFIELD WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
WAREHOUSES:
69, UPPER THAMES STREET;
COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE,
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35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
Lists may be obtained on application to
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JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
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MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
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J. & H. ROBUS,
CONTRACTORS
FOR THE
ERECTION OF NEW & REMODELLING OF EXISTING GAS-WORKS.
RETORT-SETTING A SPÉCIALITÉ.
RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
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THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
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GEORGE GLOVER & CO.,
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
For the English Government, and for the Government of the Netherlands;
MAKERS OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.;
236, GEORGE STREET, GLASGOW; AND 30, LANCASTER AVENUE, MANCHESTER.

G. G. and Co. have received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

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LIVERPOOL: No. 63, Paradise Street.
MANCHESTER: Barlow's Croft, Chapel Street, Salford.
PARIS: No. 38, Rue du Chateau d'Eau.
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THE

LANCASHIRE GAS-METER COMPANY,

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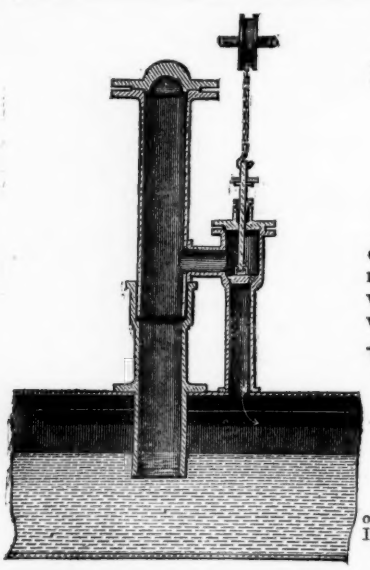
MANUFACTURERS OF

GAS-METERS, GOVERNORS, EXPERIMENTAL GASHOLDERS, &c.

HENRY THOMAS, Managing Director.



COPP'S PATENT GAS APPARATUS

For the Removal of all Pressure caused by the Hydraulic Seal;

THE EFFECTS PRODUCED BEING

1.—A LARGE INCREASE IN THE YIELD OF GAS.

2.—AN ENTIRE PREVENTION OF THE DEPOSIT OF CARBON.

3.—THE ASCENSION-PIPES DO NOT CHOKE.

The apparatus is very simple in construction, and cannot get out of order, and being an outside addition to the present arrangement of works, can be applied so easily as to require no alteration of plant. It may be fitted whilst the retorts are in use, without interfering with the manufacture of gas. The cost is so small that the outlay will be repaid in a few weeks' working. For further particulars apply to the Patentee,

W. L. COPP, WATCHET GAS-WORKS, SOMERSET,

or, 232, BRIXTON ROAD, LONDON, S.W.

The following is the opinion of JAMES PATERSON, Esq., President of the British Association of Gas Managers:—

WARRINGTON, *July* 12, 1875.

DEAR SIR,—I am obliged by your drawings, and cannot but say to you that I entertain a favourable opinion of your patent arrangements for the removal of the hydraulic seal when the retorts are in operation. It appears to be amongst the best, and probably the best, of the various devices in use for that purpose.

Mr. W. L. COPP. Yours truly, JAMES PATERSON.

TRADE MARK

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

London Agent: W. G. DAVIS, 2, BRABANT COURT, PHILPOT LANE, E.C.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

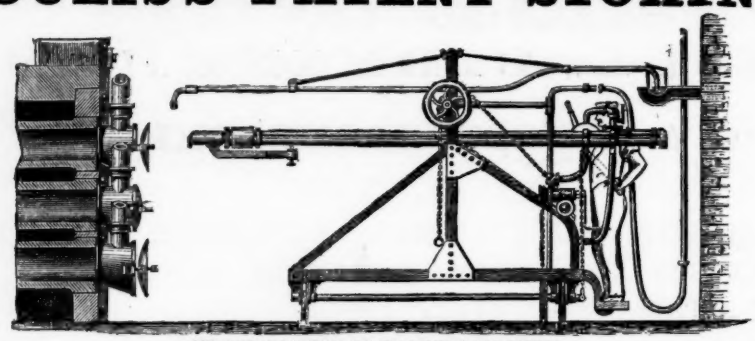
BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

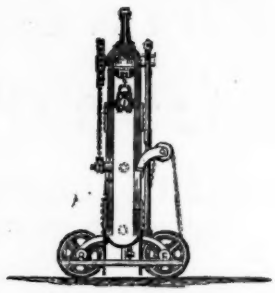
100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE.



END ELEVATION.

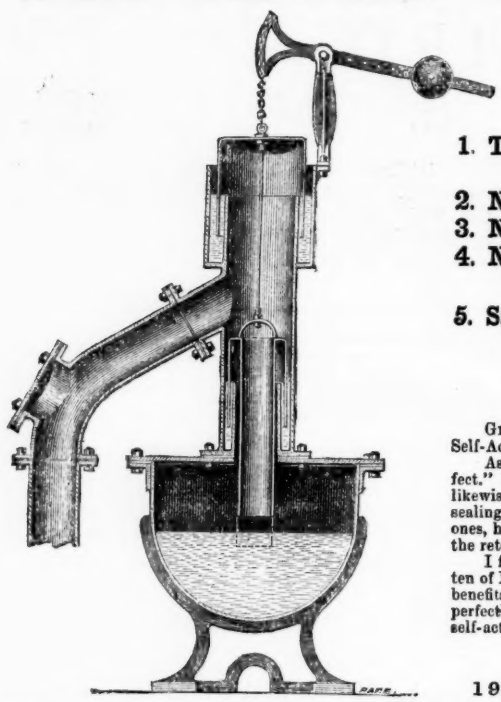
(*The Charging Machine will be Illustrated in next week's Advertisement.*)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz;
Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

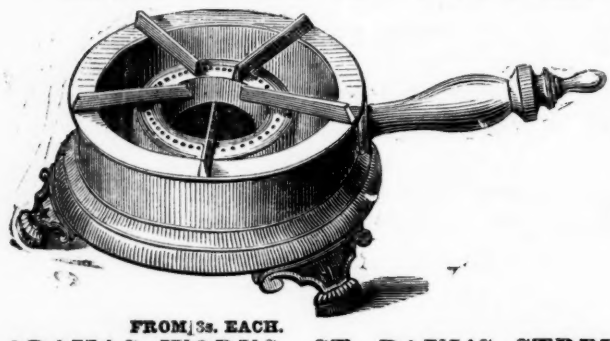
19, GREAT GEORGE STREET, WESTMINSTER.

PRIZE MEDALS—1862, 1867, 1871, 1874.

SIDNEY LEONI AND CO.,

SOLE LICENSEES AND AGENTS FOR GREAT BRITAIN FOR

GIROUD'S PATENT RHEOMETER.



This Instrument is easily fixed under any Burner; it regulates the volume of Gas to be consumed, notwithstanding the Size of the Burner or the Variation of Pressure.

Full particulars on application, also Pamphlets on the "ADVANTAGES OF COOKING AND HEATING BY GAS." With Illustrations, &c., of the latest and most improved

GAS KITCHENERS, GRILLERS, COOKING STOVES, REGISTERED BOILING STOVES (See Margin); also the NEW SAFETY PATENT TUBULAR GAS BOILERS.

LIBERAL TERMS TO THE TRADE.

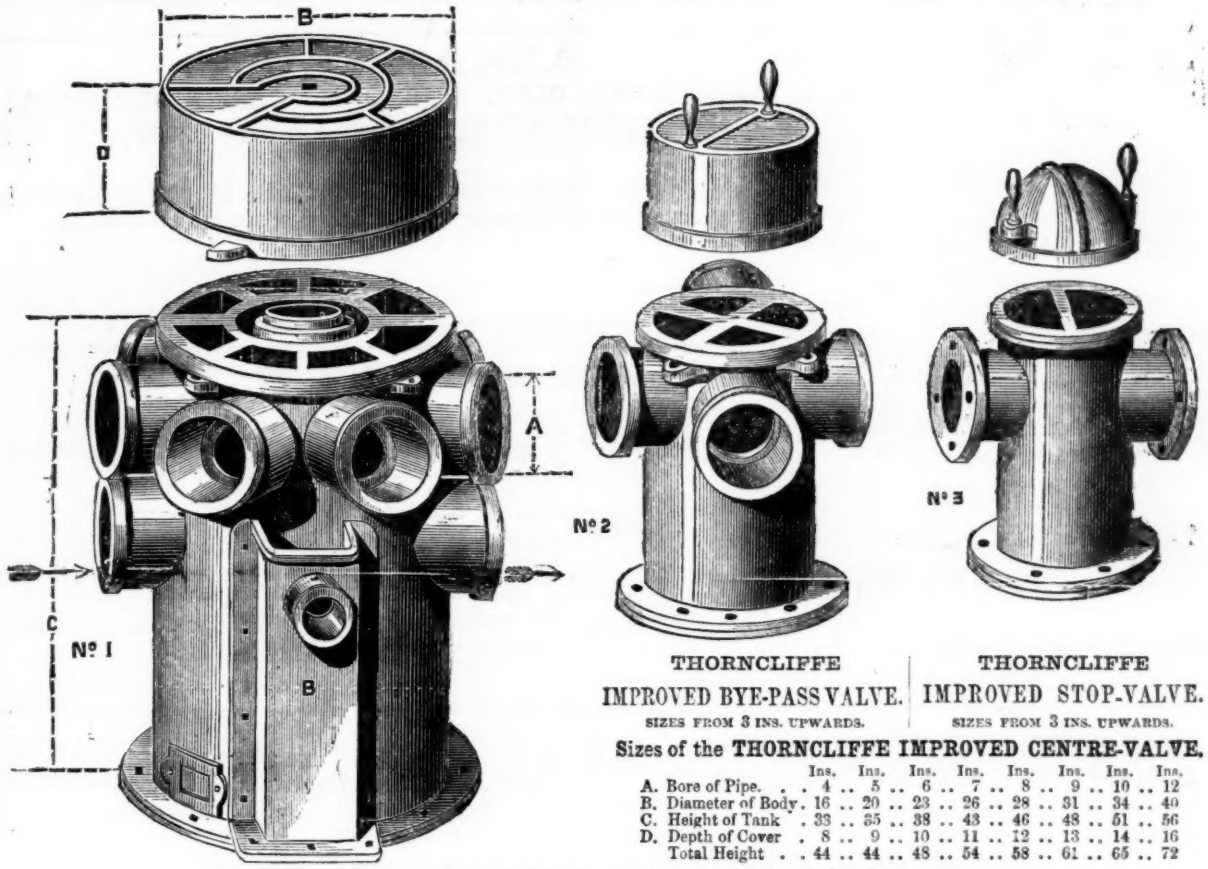
FROM 3s. EACH.

ADAMAS WORKS, ST. PAUL'S STREET, NEW NORTH ROAD, LONDON, N.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

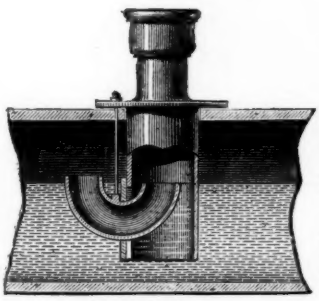
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



DIP-PIPE, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

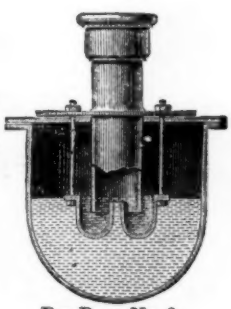
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



DIP-PIPE, No. 2.

FOR PRICES, TESTIMONIALS, &c., APPLY TO

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

HOPKINS, GILKES, & CO.,
LIMITED,
MIDDLESBOROUGH,
SUPPLY GAS & WATER PIPES of EVERY SIZE.
Plain, Turned and Bored, and Coated.
CAST-IRON RETORTS.
Castings for Gas-Works of every description.
EXHAUSTERS.
LONDON OFFICE: 25, LAURENCE POUNTNEY LANE.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,
CITY ROAD, LONDON, N.,
Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
CHARLES HORSLEY, Agent.

CAFFALL, THOMAS, & CO.,
LIMITED,
Are prepared to supply and erect their
PATENT MOVEABLE SEALS
FOR DIP-PIPES,
Or to grant Licences for the Manufacture and Use of the same.
Particulars may be obtained on application at the Offices,
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C. & W. WALKER,
MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE,
MANUFACTURERS OF
TELESCOPIC AND SINGLE-LIFT
GASHOLDERS,
CAST & WROUGHT IRON GASHOLDER-TANKS,
CONDENSERS, SCRUBBERS, & PURIFIERS.
LONDON: 8, FINSBURY CIRCUS, E.C.

JOHN HALL AND CO., STOURBRIDGE,
Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

B. GIBBONS, JUN.,
DIBDALE FIRE-CLAY, BRICK, AND GAS-RETORT WORKS,
STOURBRIDGE (Established 1834),
MANUFACTURER OF EVERY DESCRIPTION OF
Burs, Lumps, Stays, Shields & other Bricks, & Gas-Retorts,
A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular .	14 in.,	15 in.,	16 in.,	18 in.
Ovals . .	17 in. × 14 in.,	17 in. × 15 in.,	20 in. × 15 in.,	21 in. × 15 in., &c.
D's. . .	14 in. × 14 in.,	15 in. × 12 in.,	15 in. × 13 in.,	17 in. × 14 in., 18 in. × 13 in.
	18 in. × 15 in.,	20 in. × 16 in.,	22 in. × 14 in.,	24 in. × 14 in., 24 in. × 15 in., &c.

Special attention given to the execution of Export Orders.

JAMES MILNE & SON,
GAS ENGINEERS,
Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
EDINBURGH, AND
2, KING EDWARD STREET,
NEWGATE STREET, LONDON.
Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.
STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

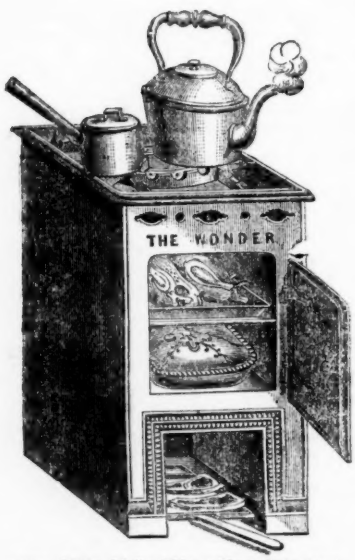
Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.



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For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

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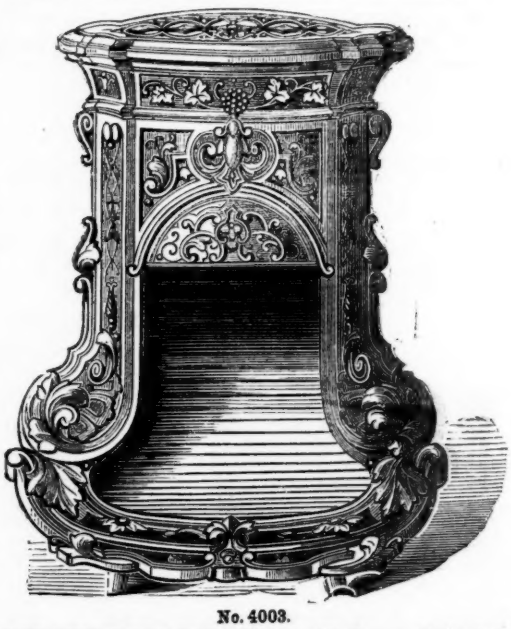
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THE CHEERFUL GAS STOVE, with Copper Reflector,
Has all the appearance of a Bright Fire.
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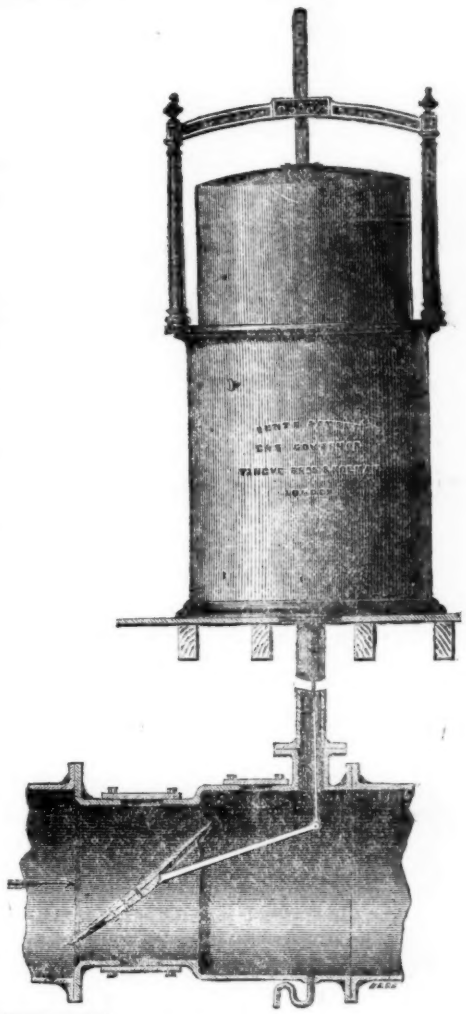
LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

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There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Co.—two 36 in. at Blackfriars.
" " a 36 in. at Goswell Road.
" " a 24 in. at "
" " a 24 in. at Whitechapel.
" " an 18 in. at Bow Common.
" " a 24 in. at Beckton.
" " a 6 in. at "
The London Gas Co.—a 24 in. at Nine Elms.
" " an 18 in. at "
" " an 8 in. at "
The Exeter Gas-Works—a 24 in.
" Abergavenny Gas-Works—a 10 in.
" Birmingham Gaslight Co.—an 8 in.
" Monmouth Gas-Works—an 8 in.
" Devonport Gas-Works—an 8 in.
" Cannes Gas-Works—an 8 in.
" Mentone Gas-Works—an 8 in.
" Rochdale Gas-Works—a 4 in.
" Imperial Gas Co., a 12 in at Great Cambridge Street.

TESTIMONIAL.

The Gaslight and Coke Company, 9, Water Street, New Bridge Street, Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

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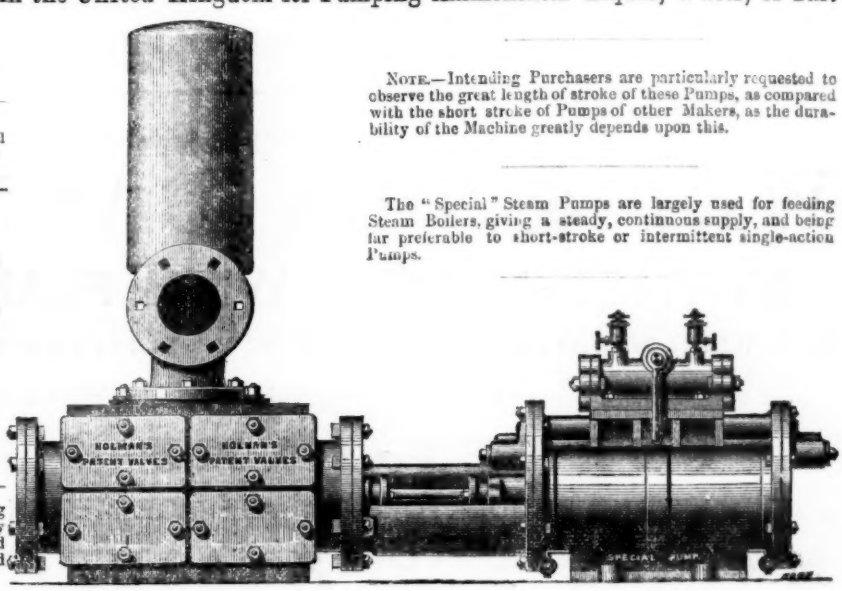
Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4*	2	9	815	18
3	3	9	1,830	18
5*	3	12	1,830	22 10
4	4	12	3,250	25
6*	4	12	3,250	30
5	5	12	5,070	32 10
7*	5	12	5,070	40
6	6	12	7,330	40
8*	6	12	7,330	50
7	7	12	9,750	50
10*	7	12	9,750	65
8	8	18	13,000	65
10	9	18	16,500	80
10	10	24	20,000	100
12	12	24	30,000	140

* These sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance piece between steam and pump cylinder at a small extra cost.



NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The "Special" Steam Pumps are largely used for feeding Steam Boilers, giving a steady, continuous supply, and being far preferable to short-stroke or intermittent single-action Pumps.

London 1851. New York, 1853. Paris, 1855. London, 1862.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

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2nd, Are suitable for all climates, whether hot or cold;
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6th, Prevent jumping or unexpected extinction of the Lights;
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Are upheld for five years without charge.

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(SUCCESSORS TO SAMUEL CROSLEY,)

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WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

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STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 7, 1875.

Circular to Gas Companies.

THE formalities connected with the transfer of the Birmingham Gaslight and Coke Company to the Corporation were duly completed on the 1st inst. The chief of them was, of course, the payment of the purchase-money—£450,000. This the directors have now to divide, according to the scheme we mentioned last week, and then the company will be wound up and dissolved. We have said before that we regard the sum paid as inadequate. When the proposal to purchase was first made, the company were suffering from reduced dividends, in consequence of the defalcations of their late secretary. But, before the purchase Act passed, they had recovered their position, and were again paying full dividends. There may be reasons with which we are unacquainted, but we have never been able to see why the two companies should not have been bought up on the same terms.

We understand that the legal formalities in connexion with the transfer of the Birmingham and Staffordshire undertakings are likely to be completed by the end of this month, at which time the Corporation will take possession. The consideration in this case, it will be remembered, is perpetual annuities equal to maximum dividends, redeemable on agreement. Of course, no shareholder will accept less than 25 years purchase. This will be equivalent to a premium of 150 per cent., while, as we showed last week, the shareholders in the old company obtain a premium of only 50 per cent. There is also, we may add, a lump sum of £10,906 for division among the shareholders of the Birmingham and Staffordshire Company. Transfer on such terms may be regarded with complacency, and the fact that they were agreed to by a Radical politician like the present Mayor of Birmingham may be taken as evidence that all of that school of thought are not disposed to treat gas companies so harshly as is the Right Hon. W. E. Forster. There is in this purchase a clear recognition of the fact that shareholders are entitled to maximum dividends.

Mr. Chamberlain, we have mentioned before, has been chosen as chairman of the Gas Committee of the Corporation of Birmingham, and the appointment is the best that could have been made. There may be difficulties with some of the outlying local authorities, which no one would be so able to meet and smooth over as the negotiator for the purchase. There are, too, the gas consumers to satisfy; and to these we would say, once more: "Take care that you pay for gas, and gas only." Wonderful improvements and adornments are spoken of at Birmingham. Let the gas consumers see that they are not made to pay for them.

A short abstract of the gas accounts of the Corporation of Glasgow, for the year ending the 31st of May last, has been published, from which it appears that the gross receipts of the year amounted to £378,392 13s. 4d., and the expenditure, which includes a sum of £15,994 transferred to a depreciation-fund, amounted to £291,147 6s. 1d., showing a gross profit of £87,245 7s. 3d. The charges which have to be defrayed out of this sum, including the annuities, interest on borrowed money, sinking-fund, and a sum of £14,377 18s. 10d., deficiency on last year's account, amount in all to £83,444 0s. 3d. Thus the Corporation have the small balance of £3801 7s. to carry forward. The price of gas in Glasgow was raised by Provisional Order to 5s. 5d. per 1000. It is now intended to reduce the price to 5s., from the 1st of June last, and to abolish discounts to large consumers. At the end of November the operation of the Provisional Order ceases, and the price reverts to the maximum fixed by the Glasgow Corporation Gas Act—viz., 4s. 7d. per 1000. Notwithstanding the facts of a great reduction in the price of coal, it is the opinion of some in the Town Council that the Gas Committee will not make both ends meet this year. Since the Corporation came into possession in 1869, the mortgage debt has been increased to the extent of £531,734, and the total capital now employed in the undertaking is £1,074,505. Thus the Corporation have just about doubled the capital in six years. The increase in the consumption of gas last year was only about 2 per cent., but probably the high price was the obstacle to a larger development of business. When we receive the accounts in full, we may have some further observations to make.

Speaking of the reduction of price in Glasgow reminds us that the Wrexham Gas Company also obtained a Provisional Order, which empowered them to charge 4s. 8d. per 1000 feet until next November. The directors have, however, resolved on reducing the price to 4s. from the 30th of June last. The fact speaks well for the company.

The report of the directors of the Maidstone Gas Company, presented to the annual meeting held on August 31, has been printed. Along with it is published a report by Mr. West on the results obtained by his Drawing and Charging Apparatus (described in the JOURNAL OF GAS LIGHTING, vol. xxiii., p. 910), and also a report on the same subject by Messrs. Livesey and Woodall. The apparatus is now used with all the retorts, and the directors express perfect satisfaction with the results. Mr. West reports a gain in the production of gas equal to 4 per cent. This, we must confess, is not so much as we anticipated, and we would suggest stronger heats. Beyond the increased yield of gas, there is the further advantage of a larger bulk of coke, to the extent of 9 per cent. This advantage is somewhat counterbalanced by the friability of the coke, which would prove a source of loss if the necessity to stack it arose. We have before expressed a strong approval both of the mechanical appliances invented by Mr. West, and of the principles involved in his mode of working; and we are glad to find our opinion confirmed by two such authorities as Messrs. Livesey and Woodall.

We have not yet received the accounts, but there can be no doubt that the financial position of the company is satisfactory, although we do not suppose a maximum dividend has been declared. The price of gas in Maidstone is only 3s. 6d. per 1000, and it is not likely that sufficient profit has been made to allow of the payment of full dividends. The directors are about to issue the remainder of the capital, £11,000, in 440 shares of

£25 each, which will be allotted, *pro rata*, among the existing shareholders. Those not taken up will, we presume, be sold by auction, as was done in the case of the previous issue, when premiums amounting to nearly £2000 were realized.

Mention is, of course, made of the proceedings of the Town Council with reference to the company; but the directors express no anxiety as to the result. So far, the action of the council has been distinctly advantageous to the company since it has given the latter the opportunity of proving conclusively that they have studied the interests of the consumers rather than those of the shareholders.

Burntisland is agitated on the gas question, and a section of the inhabitants are endeavouring to persuade the Town Council either to buy up the existing works, or to set up a competing undertaking. To the former course there can be no objection, and we have little doubt the council may obtain the works if they will pay a fair price for them. To the latter course there are several objections, mainly of a legal character. We notice that the agitators speak confidently of Sir W. Anstruther's Bill becoming law next session. If, however, any such Bill should pass, we are certain it will contain a provision—no less necessary for the protection of ratepayers than of gas companies—which will prevent the expenditure of public money in a ruinous competition with a gas company.

Knowing the present state of public feeling in Southampton with regard to the gas company, we see, with much regret, the proceedings reported in another column. It is not always politic to do what may be legally right. The 16th section of the Gas-Works Clauses Act, 1847, fully justifies a company in cutting off a supply when a consumer neglects to pay his gas-rent; but the dispute in this case arose out of the defective registration of a meter, and therefore was pre-eminently a matter for arrangement or arbitration. It would have been far better if, in this instance, the company had assumed that the Act of 1871 did apply to them, and had proceeded under the 20th section of that Act, which, in cases of disputed consumption, makes two justices the arbitrators.

As regards the application of the Act of 1871 to companies incorporated before that Act came into force, we should certainly like to see the decision of Justices Lush and Quain tested by an appeal to another tribunal. We have already announced our belief that the decision is bad, and we are supported in our view by eminent legal authorities, who have expressed a confident opinion that the judgment would have been reversed on appeal. We are sorry that the Commercial Company did not carry their case to another court; but we have great doubts whether it is worth while for the Southampton Company to indulge in further litigation.

An indignation meeting has been held at Barking. The gas company there charge 5s. 6d. per 1000, and a resolution passed at the meeting "demands a reduction to the extent of 4s. per "1000," meaning, of course, a reduction to 4s. per 1000. If the gas company will not grant this, and extend their mains to districts where they will not pay, a threat is made that the inspectors will proceed to light the town with petroleum lamps. Five shillings and sixpence is certainly a long price; but it may be justified at Barking. The works are in process of reconstruction, and the directors admit that fault might recently have been found with the quality of the gas, but that the defects will soon be remedied.

News comes from South America that a Meat-Preserving Company are lighting their premises with gas made from the bones of the animals they slaughter. When bones with the fat in them are distilled in a retort, an offensively smelling liquid (Dippel's oil) is obtained, together with an inflammable vapour, which may certainly be used for illuminating purposes. The quantity is, however, relatively small, and depends entirely on the amount of fat in the bones. We shall not be at all surprised to see the idea taken up by some ingenious inventor (?), and very likely a company will be started to supply gas made from bones.

At Dawlish the Local Board pour carbolic acid down the drain, and then some members complain that the gas company makes a stink. It is right to say, however, that when they find out their mistake they candidly admit it. These so-called disinfectants are the greatest nuisances of the day. At the present time you can hardly go anywhere without having your nose offended by the smell of carbolic acid or chloride of lime. They are generally used where they are not wanted, and, if they were needed, in a manner certain to be of no avail. The public, however, like to live in a "fool's paradise," even if it be an unsavoury one.

Most of our readers, we think, will share our regret that the committee appointed by the American Gas Association, to report on naphtha gas, have not been able to complete their investigations, and give us the results of their inquiries. Experiments have been made in America, on a much larger scale than any conducted in this country, but with the same result on both sides of the Atlantic—failure. Most of the gas companies, in the States, who began the use of naphtha (petroleum we call it) have given it up, and gone back to coal; and in Pennsylvania, the centre of the petroleum district, gas made from the oil was found to be too dear, and must have been very dear indeed, seeing the prices commonly charged there for coal gas. This result is not encouraging to the experimenters on this side of the water. If gas cannot be produced from petroleum at a cheap rate in Pennsylvania, where is it likely to be? We have been told that in the case of the New Gas Company the portion of spirit carried away by the gas cost the company 3s. per gallon, although the bulk cost but 8d. per gallon. If this is true, and is the common experience, there is an end to all our hopes of cheapening gas by the assistance of petroleum. We shall wait with some impatience for a report from the American Committee, which is still promised.

Practical gas managers will read with much interest the valuable paper by Mr. Forstall, "On the Proper Preparation of Lime for "Use in Purification." The author seems to have anticipated Mr. Cleland in the discovery of the fact, that lime is in the best condition for purification when it is so much moistened that the material may, by manipulation, be made to assume a granular or nodular form. The discovery is of great importance, for Mr. Forstall shows that, with a proper degree of moisture, a bushel of lime has just double the purifying power ordinarily assigned to it. The cost of purification is thus halved. The failure of recent attempts to get rid of "sulphur" by other means than the use of lime, throws us back on this material. What is now wanted is the means of revivifying foul lime, which, if it could be effected at less than the cost of the original material, would still further reduce the expense of purification. A process for the purpose has been indicated in these pages (J. G. L., vol. xxiii., p. 75), and if results obtained in laboratory experiments can be imitated on a large scale, the process will be a certain success.

Water and Sanitary Notes.

The Halifax Corporation Water Committee have recently issued a circular to their trade customers, announcing that after the present quarter they will refuse a supply to all consumers who do not sign a form of agreement submitted; the effect of which is to indemnify the Corporation from all loss. This is, no doubt, a very proper and justifiable proceeding, but we believe that if it had been adopted by a water company, the propriety would have been strongly questioned. It is, of course, natural to wish to conduct a business without risk, and the accidental flooding of a factory is sometimes an expensive catastrophe. It is, we presume, against risks of this sort that the Corporation desire to protect themselves.

The ineffectual opposition of the Corporation of Hull to the Newington Water-Works Company's Bill has cost the ratepayers £1414. The Corporation have paid the money, which might have been spent to greater advantage on the improvement of their own undertaking.

The Water Commissioners of Dundee have been engaged for the past year or two in making large and important additions to their water system. The works are now reported as completed, and ready for opening, but a difficulty has arisen. In a contract with two Glasgow firms for the supply and laying of iron pipes from Lintrathen to Dronly, it was, according to the commissioners, stipulated that after the pipes had been laid they should be tested, which was to be done "by stopping up the end at "Dronly and letting the water gradually on until the greatest "hydrostatic pressure they (the pipes) will have to bear is "attained." The two firms in question decline to assist at the test, and respectfully inform the commissioners that if they make it they must do so at their own risk.

Their excuse appears to be that the pipes have already been tested at Glasgow with a vertical pressure of 960 feet, which is nearly double what they will be required to bear when in use, and that the repetition of pressure tests is dangerous. The commissioners appear to have resolved on making the test themselves, at the contractors risk, they say; so that if a burst take place, we shall hear of some legal proceedings. If we remember rightly, allegations have been made that the specifications passed by the commissioners have not been strictly adhered to, and that the variations have been made with the assent of the officers of the commission.

Death of the Chairman of the Commercial Gas Company.—Mr. Thomas Brushfield, who since 1873 has filled the chair of the Commercial Gas Company, expired at his residence in Church Street, Spitalfields, on the 1st. inst. The deceased gentleman was a J.P., Deputy-Lieutenant of the Tower Hamlets, and Member of the Metropolitan Board of Works for the Whitechapel District. He was in the 78th year of his age.

Legal Intelligence.

SOUTHAMPTON PETTY SESSIONS.—SATURDAY, AUGUST 21.
(*Before Mr.* COOKSEY, *Chairman, and a Bench of Magistrates.*)

CONVICTION FOR REFUSING TO SUPPLY GAS.

The Southampton Gas Company were summoned for having, on the 30th of June, 1875, unlawfully neglected and refused to give a supply of gas to one James Ireland, he being an owner of certain premises within the limits of the special Act, entitled to the same under such pressure as was prescribed.

Mr. W. A. KILLBY appeared for complainant, and Mr. C. C. SMITH, secretary to the gas company, pleaded "Not guilty" on their behalf, and said he had, at the outset, several objections to take to the form of summons.

Mr. KILLBY questioned Mr. Smith's right to appear before the court at all.

Mr. SMITH said the company, in such a case as the present, could only act officially through their secretary; there was no other recognized servant, and he appeared on their behalf.

The CHAIRMAN asked if there was any clause in the company's special Act giving authority to the secretary to act for them.

Mr. SMITH said there were a number of clauses which recognized the acts of the officials as acts done by the company. The objection to his appearance had quite taken him by surprise. Companies, being corporations, could not appear at all except by their officials.

The CHAIRMAN said the magistrates had consulted their clerk, who bore them out in their opinion that, if there was no clause in the Act whereby the secretary was constituted the proper officer to be sued, he had no *locus standi* in the court, and, unless Mr. Smith could show this provision, they could not permit him to be heard. They would, however, grant an adjournment for the company to procure a solicitor.

Mr. SMITH said he was not prepared to do anything but let the case take its course, for he believed the whole thing to be illegal. The best thing would be for the case to proceed, leaving the company such legal rights as they possessed hereafter. They had, of course, a right of appeal.

Mr. KILLBY stated the circumstances of the case to be that lately the complainant's meter, rented by him of the company, failed to register. When this was discovered, the company, in accordance with their custom, made a charge for the quarter's gas, which was not ascertainable, the same amount as was consumed in the corresponding quarter of last year. To this, however, Mr. Ireland objected, as a gas-stove then regularly in use had for the past quarter scarcely been used at all. Correspondence passed between the parties, and eventually the company, after demanding the amount of Mr. Ireland, and he not paying it, saying he was ready to defend any proceedings for its recovery, cut off his supply of gas, illegally as he (Mr. Killby) contended, and for which they were liable to a penalty of 40s. per diem. He urged that nothing in the nature of a proper demand of the account was made by the company, for the amount consumed being unascertainable, they should have first gone before the county court or other authority, for the purpose of fixing it. He then referred in detail to various Acts of Parliament bearing upon the case, observing that in 1871 an Act called the Gas-Works Clauses Amendment Act was passed compelling companies to supply gas under certain conditions. He had no doubt that the company, if they were represented, would urge as an argument that under section 3 this Act does not apply to them, for the words "the provisions of this Act shall apply to every gas undertaking authorized by any special Act hereafter passed" were not meant to apply to gas companies previously in existence, but he quoted the case of *The Commercial Gas Company v. Scott*, in which Justices Lush and Quain held that the effect of section 3 was not to limit the application of the Act to gas companies thereafter incorporated, but to extend its application to those companies already incorporated under the Act of 1847. He also quoted the case of *The New River Company v. Mather* to prove that before an amount could be said to be due, so as to justify a company in cutting off the supply of an article like water or gas, it must be a fixed and ascertained sum, and this, it was clear, could not have been arrived at in the present case by the company, seeing that the meter had failed to register, and there was no other mode of telling what was the consumption.

Plaintiff was then called, and gave in evidence the above facts, and afterwards his wife, who proved the non-use of the gas-stove during the period in dispute.

The magistrates then retired to consider their decision, and upon their return, in about ten minutes time, the CHAIRMAN said they considered the case proved against the company. Of course, the penalty of £2 per day would be out of all character, and they fixed it at 5s. per day, which, for the 48 days which had elapsed since the cutting off of the gas supply, would amount to £12.

Mr. KILLBY asked that half the penalty should go to the informer, who, if he received it, would give it to some charity. It must be remembered that he had been put to great trouble and expense, and there was power given for such an order in the Lands Clauses Act.

The CHAIRMAN: If there is power in the Act, the magistrates cannot object to it.

Mr. SMITH asked, as a matter of courtesy, that the magistrates would allow him to say that his company would appeal against this decision. There was also a summons taken out against Mr. Ireland by the gas company, for the recovery of the amount in question.

Mr. PEGLER said their jurisdiction as magistrates was ousted, he believed, where the amount was in dispute; but Mr. Bance, the collector, said he appeared in the usual way to support the summonses.

Mr. SMITH: Am I allowed to appear in this case.

Mr. KILLBY: As a matter of consistency I shall take the same objection.

Mr. SMITH: I was allowed to appear before the bench against one of their own body the other day, and no objection was raised. You positively allow my collector, who is not a legal representative, to appear, and yet not the secretary.

Mr. PEGLER: We allow you to appear and give evidence. Mr. Bance will not attempt to address the bench.

Mr. *Bance* was then sworn, and said there was £12 15s. 2d. due from Mr. Ireland for gas.

Mr. KILLBY: How do you know that?

Witness: I go by the receipts put in my hands by the company to collect.

Mr. KILLBY: Then you know nothing about it.

Witness: I will put in Mr. Ireland's request for gas to be supplied.

Mr. KILLBY: You must prove the handwriting.

Witness: I can prove it is in the same handwriting as letters received from him.

Mr. KILLBY: But have you ever seen him write?

Witness: No.

Mr. KILLBY: Then that is the end of your evidence.

Mr. *Bance* asked that the case might be adjourned, as he had not sufficient evidence.

Mr. KILLBY: You know perfectly well what the defence will be, that you cannot prove the company have supplied any amount of gas.

The case was then adjourned to the following Friday.

On Friday, Aug. 27, when the case was called on, Mr. KILLBY, who appeared on defendant's behalf, said it had been intimated to him that the summons had been withdrawn, and he asked that it might be dismissed.

The gas company not appearing, the summons was dismissed accordingly.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

Dr. Whitmore, in his annual report for 1874 on the gas supply of Marylebone, says the mean illuminating power of the gas supplied by the Imperial Company, which lights nearly all the parish, was, for the whole year, when consumed at the rate of 5 cubic feet per hour, through a 24-hole standard Argand burner, equal to the intensity of light given by 16 sperm candles of six to the pound, consumed at the rate of 120 grains per hour each candle. It ranged between a monthly mean of 16·45 and 15·53 candles. The highest illuminating power observed on any single testing during the year was equal to 18·91 candles; this occurred in the month of February; the lowest was 14·41 candles. The largest amount of light was given in June, July, and September; the least in April, May, and November. The legal standard of illuminating power by this gas is 14 candles; the mean, therefore, for the entire year was two candles in excess of it. The mean amount of sulphur found in 100 cubic feet of this gas was 21·48 grains, or about 4 grains less than in the previous year. The monthly means varied from 38·02 to 14·78 grains; generally it was less in the spring and summer months, and more in the autumn and winter months. With regard to ammonia, this impurity may be considered to have been practically got rid of, the mean for the year not being more than half a grain in 100 cubic feet of gas. The mean illuminating power of the Chartered Company's common gas, which lights the houses on the north side of Oxford Street and some few others at the south-western boundary of the parish, was equal to the light of 16·37 sperm candles; the monthly mean ranged between 16·12 and 16·73 candles; the highest on any single testing was 17·64 candles, the lowest 15·50 candles. The Act of Parliament has fixed the standard of this gas at 16 candles; the mean of the whole year was, therefore, one-third of a candle in excess of it. The mean quantity of sulphur found in 100 cubic feet of this gas was 14·45 grains, and of ammonia half a grain; the comparatively small quantity of sulphur in this gas is owing to the use of lime in its purification, but which, in consequence of the extremely offensive character of the residual products, cannot be used in gas-works situated in a thickly populated locality. The mean intensity of light of the cannel gas, as tested by a standard bat's-wing burner, consuming gas at the rate of 5 feet per hour, was equal to 20·69 sperm candles; it ranged between a mean highest of 21·60 and a mean lowest of 19·96 candles. The greatest amount of light observed on any single testing throughout the year was equal to 22·61 candles, the smallest to 19·56 candles. The mean amount of sulphur found in 100 cubic feet was 20·52 grains, and of ammonia 0·63 of a grain. The pressure of all the gases throughout the year was generally satisfactory. After November, and until the early hours of the evening, the pressure of the Imperial gas ranged between 8-10ths of an inch and 12-10ths; but during the evening it rose to 2 inches. On no occasion throughout the year was sulphuretted hydrogen detected in either of the three gases by the ordinary test.

CONSUMPTION OF GAS BY THE CORPORATION OF LONDON.—According to Mr. Scott, the Chamberlain, the cost of gas at the Mansion House during 1874 was £434 12s. 6d. On Lord Mayor's day, £200 was "contributed" to meet the expense of the same commodity. For public lights, the Commissioners of Sewers paid, during the time in question, £16,357 9s. 9d. This was exclusive of the following expenses:—Mr. H. Sporne, inspector, £275, as one year's salary; £370 5s., general expenses; Mr. Heisch, gas examiner, and his assistants, £581. Upon the City's estate, £52 10s. is charged for the examination of street-lamps in the City, as is £26 5s. in favour of Mr. Paterson, for furnishing reports, &c. The Special Gas Committee's expenses amount to £100.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the composition and quality of the metropolitan waters in August, 1875:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	20·40	0·144	0·146	0·0015	15·4	4·0
West Middlesex	18·03	0·040	0·146	0·0000	14·0	3·3
Southwark and Vauxhall	No Return.		No Return.		No Return.	
Chelsea	20·18	0·096	0·146	0·0015	15·8	3·8
Lambeth	20·10	0·103	0·166	0·0015	15·4	3·8
Other Companies.						
Kent	34·80	0·014	0·322	0·0000	21·6	11·6
New River	17·77	0·055	0·114	0·0000	14·3	3·3
East London	20·30	0·103	0·138	0·0015	15·4	4·9

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, in those of the Grand Junction, Chelsea, and Lambeth Companies. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Society of Medical Officers of Health, 103,054,818 gallons; and the number of houses supplied was 439,077. This is at the rate of 29·9 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 31·4 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne.

HY. LETHEBY, M.B.

Dr. Whitmore, in his annual report for 1874 on the water supply of Marylebone, says the water supplied to the inhabitants of the parish by the West Middlesex Water Company maintained its characteristic purity; it was almost uniformly bright, clear, and well filtered, perfectly free from taste or smell, and on no occasion, when subjected to microscopical examination, could either living or dead germs or organisms be found in it. As I have often before had occasion to state, this is due to the ample provisions made by the company for its storeage and efficient filtration—so ample, indeed, and so efficient, that even after heavy rainfalls and floods it is supplied to the consumer perfectly free from the least turbidity. The water supplied by the Grand Junction Company has manifestly improved during the past year, and this is due to largely increased facilities for storeage and filtration; with but some few exceptions this water has also been uniformly clear and bright.

ST. ANNE'S-ON-THE-SEA GASLIGHT AND COKE COMPANY.—This company has just been registered, having been formed to supply gas to the town of St. Anne's-on-the-Sea, in the parish of Lytham, Lancashire. It is proposed to have a capital of £15,000 in £5 shares.

EASTBOURNE GAS COMPANY.

The Half-Yearly Meeting was held on Monday, Aug. 23—Dr. JEFFREY in the chair.

The following report of the directors was taken as read:—

From a comparison of the working account with that of the corresponding period of last year it will be observed that the business of the company still increases.

Having taken into account the liabilities and assets of the company on the 30th of June last, the directors find that there is a balance of £1142 12s. available for a dividend, and they accordingly recommend that a dividend at the rate of 7 per cent. per annum be declared and paid upon the £5000 capital raised by the issue of 500 "B" shares (being the full amount to which they are entitled under the Act of Parliament incorporating the company) and a dividend at the rate of 9 per cent. per annum upon the £20,000 original capital of the company, which, with the dividend declared in February last, makes the dividend for this year £9 10s. per cent., being £2 10s. per cent. more than the dividend for the preceding year.

After payment of these dividends there will be a balance of £67 12s. to be carried forward on the working account.

The CHAIRMAN, in moving the adoption of the report, remarked that in the interval since the last meeting, time had treated them very leniently, he might say beneficially, and for that they ought to be thankful. During the half year one chief item in their accounts, coal, had been less than for some time past, and if they could ensure cheap coals he believed they would be able to pay fair dividends. They had met to propose a dividend of 9 per cent. for the half year, which would make for the whole year 9½ per cent., or 2½ per cent. more than the previous year. They not only wanted good dividends, but they wanted cheap gas, and he was one of those who thought a gas company should always pay 10 per cent. They had not received that every year, and he should not be happy till they did. He was quite convinced that, with coals at a reasonable price, they would be able not only to get a 10 per cent. dividend, but also eventually to lower the price of gas to consumers. Many of the shareholders in the company were large consumers, and the dividend they received was of minor importance really to getting cheap gas. Still the directors, whom they had set to look after their interests, considered that in the first place they should have a fair return for the money they had invested in the business. A considerable outlay had to be incurred every year for laying down new mains. The town was rapidly extending, and of course they had to keep pace with it; and the money so spent was so much sunk capital, from which at the present moment they were not reaping much benefit. Cheap coals and the extension of their business were conditions that would tend to cheapen gas in Eastbourne. He did not say the gas was not cheap; it was cheaper than in many other towns similarly situated—for they paid more for the carriage of coal than some places—and it was better in quality. The directors had most regularly attended the meetings during the half year, and had given all diligence to the working of the company. On each occasion of their meeting they had had presented to them a statement which showed not only that the gas was good, but that the illuminating power was above that required by the Act of Parliament. He might mention to the shareholders that the local board had instituted a new system of lighting the town—namely, burning gas for public lamps by meter, and he thought the system was a very good one. The board certainly only paid for what they consumed, and if they were satisfied he was sure the company was. He concluded by moving the adoption of the report.

Mr. GILBERT seconded the motion, which was carried *nem. con.*

The CHAIRMAN said that three of the directors retired by rotation every year, and that the outgoing members of the board were Mr. Insoll, Mr. Lenny, and Mr. Guy. Mr. Sheridan had ceased to be a director, inasmuch as he had disposed of the whole of his shares, and it was for the meeting to say whether they would fill up this vacancy, or adopt the recommendation of the directors that it should remain unfilled, thereby conforming more nearly to the dictum of Lord Redesdale when the company obtained their Act, that the number of the directors should be only six. He stated that Mr. Insoll and Mr. Lenny had attended 11 out of 12 meetings, and Mr. Guy the whole number. Having seen the assiduous attention given to the company's affairs by these gentlemen, as well as the directors generally, he begged to propose that they be re-elected.

Mr. GILBERT, in reference to the election of a director in the room of Mr. Sheridan, said the capital of the company had now increased to £30,000, and he thought there ought at least to be as many directors now as when it was much less; he therefore proposed that Mr. Bradford be elected a director.

These propositions were seconded and carried, and a vote of thanks to the chairman terminated the proceedings.

WOLVERHAMPTON GAS COMPANY.

The Half-Yearly Meeting was held on Tuesday, the 31st ult.—Mr. J. UNDERHILL in the chair.

The SECRETARY (Mr. A. Jones) read the following report:—

Your directors have much pleasure in presenting their 47th half-yearly statement of accounts and general balance-sheet, duly certified by your auditor, showing the total receipts to be £22,723 1s. 5d., and the expenditure £19,310 17s. 9d., leaving a balance of £3382 3s. 8d., which, added to the balance of the last account, amounts to £3838 11s. 4d.

Your directors recommend the usual dividend of 5 per cent. to be paid, and proposed to take the balance required for that purpose from the reserve-fund.

During the past half year the usual alterations and repairs at both stations have been going forward, and your directors have every confidence that their plant is in such a working state as to enable them to meet any increased demand that may arise.

In conclusion, your directors assure you that they will continue to pursue the same policy which has hitherto given general satisfaction both to proprietors and consumers.

The CHAIRMAN moved—"That the report and statement of accounts now presented be approved and entered on the minutes." He said that perhaps some of the shareholders might feel a little dissatisfied that the company were obliged to take so large a sum from the reserve-fund as they had to do to pay the dividend. This was due to the fact that, although the coal they had been using during the past half year was to some extent cheaper, the coke which they were obliged to sell had to be disposed of at a much lower figure in proportion, there being in fact something like 5s. a ton difference between the prices of the coal and coke. The directors might, of course, have made a very different statement if they had been disposed to advance the price of gas, but throughout all the fluctuations of the coal market it had been as much as possible their endeavour to keep the gas at a uniform price, as they felt that by this means they would be best securing the interests of the shareholders and the public, which were in effect identical. They had therefore only once advanced the price of gas during the existence of the company, and they thought they now saw their way pretty clearly to keeping down to the present price. He hoped at the same time that they would be able to show a much better balance-sheet at the end of the next half year. He should like to make a remark on another point which might be of interest to the public. Last winter there were a few complaints from the occupants of the outlying districts as to the supply of gas. The admitted deficiency was due to the very large consumption that had to be supplied, and to the insufficient size of the mains. During the winter the mains could not be rectified, but since the summer had set in the company had put down new mains in several places, and very much enlarged the others, so that he trusted during the approaching winter there would be such a large supply of gas as to render it impossible for complaints to be made. With regard to the Provisional Order for enabling them to obtain new capital for the further extension of their mains, he was happy to say that the bill in which their order was embodied had passed the Houses of Parliament, and received the Royal Assent, and they were now in a position to issue the new capital. The matter could not be brought forward at the present meeting, owing to the fact that certain formalities had not yet been complied with, but a special meeting would be summoned for the purpose of authorizing the issue, in about a month or six weeks time.

Mr. COX seconded the resolution, which was carried unanimously.

The CHAIRMAN proposed that a dividend of 5 per cent. for the past half year, free of income-tax, be declared.

Mr. B. SAVAGE seconded the resolution, which was agreed to.

Mr. R. WARNER proposed that the thanks of the meeting be given to the chairman and the directors, together with Mr. J. Annan, the engineer, and the other officers of the company, for the interest they had taken in the affairs of the company.

Mr. LLOYD seconded the motion, which was also carried unanimously.

The CHAIRMAN assured the shareholders that the vote of thanks would prove an additional incentive to the directors to do in the future as they had done in the past, and be as careful of the interests of the shareholders.

Mr. ANNAN, in responding to the compliment paid to him, hoped that during the ensuing half year the profits would be sufficient to restore to the reserve-fund what they were now taking from it.

BIRMINGHAM GASLIGHT AND COKE COMPANY.

An Extraordinary General Meeting was held on Monday, the 30th ult.—Mr. J. T. COLLINS in the chair.

The SECRETARY (Mr. J. Slocombe) read the following report of the directors:—

Your directors beg to report that the Birmingham Corporation Gas Bill, having passed both Houses of Parliament, received the Royal Assent and became law on the 2nd inst. The Birmingham Gas Bill No. 1 was not proceeded with after the corporation bill had passed the Commons Committee, but the Birmingham Gas Bill No. 2 was introduced into the House of Lords and read a second time, in order to be proceeded with in case of any mischance to the corporation bill. As soon as the latter bill had passed the third reading, bill No. 2 was withdrawn.

By clause 3 of the agreement with this company, schedule 1 to the Act, the corporation are entitled to complete the purchase on a day to be named within two months after the Royal Assent. In pursuance thereof, your directors have arranged with the Gas Committee of the Town Council that the transfer shall take place on the 1st of September next. One-third of the entire profits of the half year ending Dec. 31, 1875, will be paid to the company as soon as the amount can be apportioned.

On the 1st of September the corporation will be prepared to pay the purchase-money, which will be distributed amongst the shareholders on the basis of the resolution referred to below. Interim receipts will be handed to all who have elected to receive corporation securities in lieu of cash, and the debentures and stock certificates will be exchanged for these as soon as they can be prepared by the corporation.

Your directors recommend you now to confirm the mode of division embodied in the resolution of March 24, 1874, of which the following is a copy:—"That the net purchase-money arising from the sale authorized by the preceding resolution be divided between the holders of the different classes of shares in the company in the proportion of £57 capital value of each new ordinary share, and £130 capital value of each A share, and one-tenth of £130 to each B share."

The CHAIRMAN remarked that the report placed before them in a succinct manner the result of their recent legislation. He should move that it be received and approved.

Captain BULLOCK seconded the motion, and it was carried.

The CHAIRMAN then moved the following resolution:—"That in pursuance of the power given by section 6 of the Birmingham Corporation Gas Act, 1875, it is hereby resolved that the net residue of the purchase-money paid to the company by the corporation, and all other sums in the nature of capital divisible between the shareholders, shall be divided in manner following—viz., There shall be paid in respect of each new ordinary share the sum of £57; in respect of each A share the sum of £130; and in respect of each B share the sum of £13; and the balance shall be applied to such of the other purposes mentioned in the said 6th clause, and in such proportions as the directors in their discretion shall think proper." He remarked that the sum in excess was £2660, and the directors thought there might be some contingencies to be dealt with, and it might also be thought desirable to make some compensation to the clerks.

Mr. WATSON seconded the motion, and it was unanimously adopted.

Mr. BOLTON said it would be recollected that at the last meeting he proposed that some additional recompense should be made to the directors; but he found then that the resolution could not be carried, because it was necessary to give notice of such a motion. He gave notice, and he now wished to renew the proposition. He thought the shareholders were particularly indebted to the directors for the very happy way in which they had extricated the company from the very gloomy position in which they found themselves some three or four years back, when they were told that the whole of their reserve-fund had been stolen, and that the small profits on gas-making would materially reduce their dividends. It was proposed that a committee of investigation should be appointed, and the shareholders were fortunate in selecting some unusually energetic men, led by Captain Bullock. Subsequently they were invited to join in the direction of the affairs of the company, and since that time matters had gradually improved, and the maximum dividends had again been paid to the shareholders. He thought that there was such a combination of hard labour, sound sense, good judgment, and bold measures that entitled the directors to the hearty support and admiration of the shareholders. Unmindful of their own personal interests, they had succeeded in making a bargain with the corporation in the interests of the company with which, he thought, they must all be satisfied. Under these circumstances, he had much pleasure in moving—"That in pursuance of the 6th clause of the Birmingham Gas Act, 1875, the directors be requested to retain out of the profits of the company such a sum as will make their fees from March, 1872, equivalent to those paid up to that date."

In reply to several shareholders, the SECRETARY said the effect of Mr. Bolton's motion would be that the directors would receive £450 per annum from March, 1872, as their fees were then reduced from £1350 to £900.

Mr. WILLIAMS suggested that it would be better to defer the resolution until the final meeting for winding-up the company.

Some further discussion ensued, and ultimately Mr. Bolton withdrew his motion, giving notice of his intention, however, to bring forward another one at the final meeting, which it is expected will be held about the end of next month.

Thanks were then voted to the chairman, and the proceedings terminated.

SOUTH SHIELDS GAS COMPANY.

The Half-Yearly Meeting was held on Monday, Aug. 30—Mr. ROBERT WALLIS in the chair.

The SECRETARY (Mr. J. W. Lawson) read the report, as follows:—

The directors have much pleasure in presenting to the shareholders the half-yearly report, along with the balance-sheet and accounts, ending June 30, 1875, which show the continued prosperity of the company.

The directors recommend the usual dividends of 4½ per cent. on the old, and 3½ per cent. on the new capital, which will be payable on the 7th of September next.

The new works at Jarrow are progressing satisfactorily. The company will not be able to manufacture gas at Jarrow this coming winter, but they will be able to utilize the gasholder, which will be a great advantage in tiding over the increasing demands until the completion of the works.

Notwithstanding the great cost of the Jarrow works, which are at present unproductive, your directors are happy to say they feel themselves in a position to redeem the pledge which they gave at the last general meeting, to reduce the price of gas 3d. per 1000 feet, with the usual discounts, throughout the whole of the district supplied by the company, the reduction to take effect from the 1st of July last.

The CHAIRMAN said that a copy of the report had been in the hands of the shareholders for some days, and if there was any information required thereon, he would be happy to give it, although from the small attendance of share-

holders it was evident that the report gave satisfaction. As they were aware, gas companies had had a very severe time of it during the last few years, owing to the high price of coal and labour. They had, however, fortunately, got over their difficulties; and the directors might safely say that the works were in a most satisfactory and efficient condition. During the year they had laid 360 new services, had erected 100 additional street-lamps, and laid 6400 yards of mains of different kinds, a great portion of which being new were charged to capital account. Many of the mains had become decayed, while others had become too small for the district. From this it would be seen that the outdoor work of the company had been of a very important character, for they had relaid 500 old services. They had this quarter had a much larger loss of gas than usual in consequence of some of the mains having become broken through street operations, but these escapes had been attended to, and would, it was hoped, not occur again. The directors had made their contracts for coal and these, it was expected, were of a satisfactory character. The new works at Jarrow had not progressed so satisfactorily as they could have wished, owing to the unusual severity of the last winter. They were, however, now in something like a forward condition. Two tanks had been finished, and the gasholder in one of them was at present nearly completed, and in a short time they hoped to be in a position to utilize it, and so enable them to get over the winter. The whole of those works had cost the company something like £15,000, but although the expenditure was at present unremunerative, it was satisfactory to know that they would soon be in possession of excellent works. With regard to the illuminating power of the gas, he was glad to say that it had been kept up even beyond the standard. There was only one occasion during the last six months where the gas was 4-10ths of a candle below the illuminating power. The corporation looked very carefully after the company, and very properly so, and they had consequently called their attention to this fact. While, however, this was so, he might state that the average illuminating power of the gas during the last six months had been 15·28, while their standard was 14 candles. That he considered most satisfactory. There was another matter to which he might refer—namely, that the company sometimes suffered in the public mind, in consequence of the allegation that they charged a high price for their gas. This was really not so, considering the high price of coal and labour. In Newcastle and Sunderland 4s. per 1000 feet was charged for gas, but they must remember that at South Shields their accounts were subject to discounts of from 5 per cent. to 30 per cent. As they were aware from the report, it was proposed to reduce the price of gas 3d. per 1000 cubic feet, which still kept them below the price charged by Newcastle and Sunderland. It was satisfactory to know that notwithstanding the difficulties the company had had to contend with, they had been able to maintain their dividends without greatly drawing upon the reserve-fund. They had once to withdraw £250, but they would have a surplus equal to that amount after paying their dividends, and the reserve-fund would then be nearly £6000. He considered that was a most satisfactory condition, and remarked that there was no doubt of the future prosperity of the company. He moved the adoption of the report.

Mr. J. HENDERSON seconded the motion, which was carried unanimously.

Mr. W. ANDERSON moved that a dividend of 4½ per cent. upon the first capital, and a dividend of 3½ upon the new capital, be declared for the half year ending the 7th of September. He thought the rate of dividend would be very satisfactory to all the shareholders. Respecting the new works at Jarrow, as the chairman had told them, he hoped that when they were finished they would produce the full benefits expected by the company.

Mr. FAIRBAIRN seconded the motion, and stated that it was very pleasing to them to have such a dividend, as it clearly showed that the company was prospering, notwithstanding the high price of coals.

The motion was carried.

Mr. DALE proposed a vote of thanks to the directors for their services, during the past half year, for the benefit of the company. He felt quite sure that the directors were well deserving of the hearty thanks of the company, and also of the public, if the latter had an opportunity of recording the same. As to the reduction in the price of gas, for his own part, he did not see the necessity of any reduction being made until the directors had placed themselves in a proper position to guard against any loss by fire. However, as the reduction had been made, the directors really deserved the praise of the public.

Mr. CHAPMAN seconded the motion, which was carried.

Mr. J. L. HALL returned thanks on behalf of the directors. He said it had always been a source of care and anxiety on their part to work for the benefit of the shareholders. The works at Jarrow had been progressing favourably, notwithstanding the severity of the weather during last winter. The directors had not only given collective attention, but also individual attention to the interests of the company. He believed, from the fact of the town enlarging and extending, that the reduction in the price would tend to the benefit of the company.

Mr. S. OLIVER proposed a vote of thanks to the chairman, who, he said, devoted himself so zealously to the prosperity of the company.

Mr. J. M. MOORE seconded the motion, which was carried.

The CHAIRMAN returned thanks for the compliment, and remarked that the company had abolished Sunday labour. He had to state that the directors received great assistance from the advice of his old and respected friend, Mr. W. Anderson.

The meeting then concluded.

SUNDERLAND GAS COMPANY.

The Annual General Meeting was held on the 1st inst.—Mr. ROBSON in the chair.

The report of the directors stated that, owing to a decrease in the cost of materials, the directors were enabled to announce a reduction in the price of gas of 3d. per 1000 cubic feet. They recommended that in addition to the interim dividend paid in March last, a further dividend be declared of 5 per cent. on the original stock, and of 4½ per cent. on the additional capital stock of the company, payable on the 15th inst. The stock of residuals having been realized at a price much in excess of the estimated amount, that and other favourable circumstances enabled the directors to recommend a payment of 5s. per share on the original stock of the company, on account of deficiency in dividends of previous years. In view of the proposed extension of works at Hendon, the directors asked for authority to create and issue shares for raising £20,000, part of the additional capital authorized to be raised by the Sunderland Gas Act, 1857, and to offer the said shares for sale by public auction at convenient times.

The CHAIRMAN, in moving the adoption of the report, said he thought the present position of the company was a matter of thankfulness and congratulation. After reviewing the recent history of the company, he stated that, acting on their uniform principle, they proposed, at the beginning of next quarter, to reduce the price of gas 3d. per 1000 feet, which would bring it to the price at which it stood in the cheapest of all years, 1870. Prior to the rise they also made a very handsome reduction in gas for household use, as well as in that supplied to the public lamps, the reduction amounting to something like £800, so that the outside public should certainly be very content. The company did not desire to "skin" the public, but wished rather to behave as handsomely as their circumstances permitted. They proposed early next spring extending the works by putting up a new retort-house, similar to that at Hendon, which they deemed it prudent to erect before the winter following. Sometimes the company had had to fight their battles with a very small dividend, and sometimes with no dividend at all, and it was with very great pleasure that the directors found themselves in a position to commence with the new works. He hoped the present prosperity of the company might continue.

The report was adopted, and the dividends recommended therein were declared.

The retiring directors and auditor were re-elected, and a formal resolution was passed, authorizing the directors to create and issue shares for raising £20,000 for the works mentioned in the report.

Alderman ALCOCK, in moving a vote of thanks to the directors for their services, said his opinion was that the gas supplied to the town of Sunderland was as cheap, if not cheaper, than that supplied to any other town in the kingdom. There was nothing, he thought, which could prove the satisfactory manner in which the business of the company was being carried on more than the unanimity which had characterized the meeting.

The motion was unanimously agreed to.

The CHAIRMAN, in returning thanks on behalf of the directors, said it was a real pleasure to be connected with a prosperous company, and that through serving the public in a way that no man, unless he were a born "carper," could find fault. He believed they tried honestly, and he was certain they tried unanimously, to serve the interests of that large company. He always took paucity of attendance at such meetings as a compliment to the honesty of the directors.

WREXHAM GASLIGHT COMPANY.

The Ordinary General Meeting was held on Tuesday, the 31st ult.—Mr. OVERTON in the chair.

The SECRETARY (Mr. T. Walker) read the following report:—

In their last annual report the directors informed the shareholders that a Provisional Order had been obtained, empowering the company to charge an additional 8d. per 1000 cubic feet for gas supplied until Nov. 30, 1875. In consequence of a large reduction in the price of coal having lately been made, your directors consider it no longer necessary to exercise the power given by the said order, and it affords them great pleasure to announce a reduction in the price of gas to its former rate, the same to take effect from the 30th of June last.

A decrease in the receipts for "Residual products" has taken place in consequence of their having to be disposed of at a lower rate.

During the year several new mains have been laid, principally to replace small and defective pipes. The advantage of having done this is already showing itself by a reduction in the quantity of gas unaccounted for.

The sale of gas is steadily increasing, both in the town and outlying districts.

An interim dividend, at the rate of £1 17s. 6d. per cent., was paid to the shareholders for the half year ended the 31st of December last, and there is now a balance available for the payment of one at a similar rate for the second half year, making £3 15s. per cent. per annum as authorized by the Provisional Order.

A vacancy has occurred upon the board during the year through the death of Mr. John Williams. Your directors recommend that the vacancy be not filled up.

Messrs. Overton and A. W. Edwards are the directors, and Mr. John Bury the auditor, who retire by rotation. They are eligible for re-election.

The CHAIRMAN, in moving the adoption of the report and statement of accounts, said that in the past year they had been going on in a very quiet, uneventful kind of way, and in a manner somewhat different from the year before. They would see from the statement of accounts that there had been a considerable reduction in the price of coal, which had been followed by a reduction in the price of the residuals, principally in that of coke. A large quantity of new property was now being supplied with gas, and the directors looked forward to a still greater increase in the consumption, as it was expected that the new barracks would soon require a supply. The company might take credit for having reduced the price of gas by 8d. per 1000 feet, and that too without any pressure from outside.

Mr. DAVENPORT seconded the motion, which was carried.

A proposition to retain the number of directors at nine, instead of adopting the recommendation in the report, was, after some discussion, negatived.

The retiring directors and auditor were re-elected, and £80 was voted as remuneration for the directors services.

The CHAIRMAN moved the confirmation of the interim dividend, and the payment of a further dividend at the rate of £3 15s. per cent. per annum, being the rate fixed by the Provisional Order, to be paid on the 3rd of September. He said he had no doubt that next year the dividend would be much larger.

Mr. MILLIGAN seconded the proposition, which was agreed to, and a vote of thanks to the chairman terminated the meeting.

WREXHAM WATER-WORKS COMPANY.

The Ordinary Yearly Meeting was held on Wednesday last—Mr. OVERTON in the chair.

The SECRETARY (Mr. F. Storr) read the following report:—

In accordance with the resolution of the proprietors passed at the last annual meeting, and to provide for the cost of the new works, the directors have issued the remainder of the shares authorized to be raised by the company's Act of 1864, and 800 shares under the Act of 1874. The latter have been raised as 5 per cent. preference shares. Upon both these classes of shares the first call of £2 per share has been paid.

The additional charges, amounting to £2123 19s., are chiefly in payment of the remainder of the parliamentary and engineering expenses, and in extending the main-pipes into districts not hitherto supplied by the company.

The water account for the year ended the 30th of June shows, as compared with last year, an increase of £292 2s. 1d. The total receipts for the year for water and profit upon fittings amount to £2175 14s. 9d.

After payment of the usual charges, the interim dividend at 6 per cent. and the preferential dividend at 5 per cent. per annum, for the half year ended December, 1874, and interest upon the mortgage debt for the year ended June 30, 1875, a balance remains on net revenue account of £879 0s. 6d.

The directors, therefore, have pleasure in recommending the declaration of the second half year's dividend at the rate of 6½ per cent. per annum (free of income-tax), upon the consolidated stock and ordinary shares; and at the rate of 5 per cent. upon the preference shares, and calls paid in advance, leaving a balance of £210 10s. to be carried forward to the next account.

The directors beg to suggest to the proprietors the expediency of creating a reserve-fund, which they are empowered to do under the Water-Works Clauses Act, 1847, and to this fund they propose to carry the sum of £100 out of the balance of £210 10s., carried forward.

During the year, 229 dwelling-houses have been added to the list of consumers, making a total of 1902 now supplied. The company's mains have been extended to the villages of Rhostyllen and Rhosnessney, and a supply afforded to the whole of the inhabitants of those places, and it is the intention of the directors to meet as far as possible the great want of a proper water supply in the outlying districts.

Until the new reservoir and works are completed, and to provide against any possible drought, the directors have entered into a contract for the purchase of water in bulk from a neighbouring company. The contracts for the new works, &c., authorized by the Act of 1874, have been let, and the deliveries of pipes have commenced. Considerable difficulty has been experienced by the directors in obtaining earlier possession of the land required for the reservoir, but the impediments are now removed, and the construction of the works will be prosecuted with the utmost diligence.

The CHAIRMAN congratulated the shareholders on the promising state of the company at the present time. The dividend of 6½ per cent. was the largest which had been paid, and it had been fairly earned. In addition, £100 had been carried to the reserve-fund, although, from the large number of houses that were in course of erection, and the applications that were being received continually from the surrounding district, the directors were very confident the dividend would be maintained. Still, they would have to lay out capital that might not at once be productive; and it was for that reason that the amount had been carried to the reserve-fund, so that instead of paying a dividend that could not be maintained, the dividends would be equalized, and thus shares would be prevented from bearing a fictitious value. If they were to divide the £100, the dividend would be a little more than 8 per cent., but it had been thought wiser and more prudent to make the dividend 6½ per cent. The water account showed an increase of £292 2s. 1d., the receipts having nearly doubled in six years. The

usual time for companies of that class to double their business was ten years, so that the company was progressing faster than customarily was the case. The commencement of the new works had been delayed in consequence of the death of the owner of the land, but it was hoped that it would be in the hands of the contractors in a week or two. The delivery of the pipes had commenced, and they were being laid. He formally moved the adoption of the report.

Mr. Low seconded the motion.

The Chairman, in answer to a shareholder, said the land had actually not yet been conveyed to the company. They had been in treaty with the owner and his agent for a long time, but so large a price had been asked that the company had not been able to close with them. The company had offered very fair terms, and they were confident that no jury would award so large an amount as had been offered. They had made a stand, and were determined to maintain their terms. They could give notice to refer the matter to arbitration, but no harm was being done, for if it were left for ever the company would be all the better off, the amount which the land had been valued at having been paid six years ago.

The motion was then put and carried, as was also one approving the interim dividends and the further dividend of 6½ per cent. payable on the 1st of September the directors; and auditor were re-elected; and, on the motion of Mr. W. Thomas, £80 was voted to the directors for their services during the past year.

A vote of thanks to the chairman concluded the meeting.

DERBY WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on Monday, Aug. 30—Mr. Gascoyne in the chair.

The following report was taken as read:—

The gross receipts from revenue amount to £5722 12s. 11d., as against £5650 12s. 2d. in the previous half year, and £5433 10s. 10d. in the corresponding one; or £180 11s. 5d. more than the average of both half years. The revenue expenditure is £2619 6s. 10d., as against £2371 6s. 8d. in the previous half year, and £2565 18s. 2d. in the corresponding one; or £150 14s. 5d. more than the average of the two half years.

The net profit realized is £3103 6s. 1d., as against £3279 5s. 6d. in the previous half year, and £2867 12s. 8d. in the corresponding one, or £29 17s. above the average of both; and adding to this the surplus of £2177 1s. 6d. brought forward from the last account, there now remains £5280 7s. 7d. available for dividend. The directors recommend the payment of the latter at the usual rate, which will absorb £3158 11s. 9d., and leave a net surplus of £2121 15s. 10d. to be carried to the credit of the next half year. Our contingent-fund, in addition, now amounts to £2202 11s. 6d.

The repairs of the old engines, we hope, are at length completed, and their condition is satisfactory to the engineers. Messrs. Hawksley have also passed a high eulogium on the new engines, erected by Messrs. Kitson, which they consider to be of the best description, and calculated to last many years.

The general works at Little Eaton and Breadsall, although very far advanced, are not yet completed, notwithstanding the unremitting exertions of the board to bring them to a close. This is mainly attributed, by the contractors, to their extreme difficulties with their workmen, and the board have been unwilling to interfere too precipitately.

The whole length of the large additional main from the high level reservoir at Breadsall, has now been laid, except that portion which will pass through the town itself; and the delivery of this also is being rapidly pressed forward.

The demolition of our old premises in the Wardwick has compelled the removal of the yard, offices, and shops elsewhere; and in consequence of the great extension of the works, and of the company's business, the directors have long felt the necessity of providing much greater accommodation. They have therefore purchased an eligible site for this purpose, and are about to erect new offices in a central position in Babington Lane, where the buildings and stores will be concentrated.

The Chairman said that it was the thirteenth occasion on which it had been his duty to ask the acceptance of the proprietors of that company of the past proceedings of the directors. On all occasions there had been a fair and very reasonable degree of success under circumstances of difficulty, and at the present time he thought he might apprehend that the report which had been circulated amongst them, and which no doubt they had well digested, would have produced in their minds, perhaps, an unexpected satisfaction. The financial part of their affairs must be looked upon so far as exceedingly satisfactory. The deficiency in the surplus to be carried forward to the current half year was only £55; notwithstanding the additional cost during the half year of £60, which had been occasioned by the new poor law valuation, and £340 for additional dividend and bank interest, making altegether £400. But in the current half year they would have to incur a very large and important increased expenditure. The increase in the capital on which dividends were payable they would see was only for two out of the six months, but in the next half year, of course, it would be for the whole of the six months. The increase which was now £60, would, at the end of the next half year, reach £300 or £400; consequently they must expect a large deficiency in the surplus next year. But these circumstances were not likely to occasion any depression that they were not able to bear. During the last few years £1400 had been paid out of revenue in satisfaction of interest accruing during the unproductive period of the construction of works, and if that amount had been at the disposal of the company he need not say that they would have been in a much better position than they were now. He had generally contended that such interest should be taken out of capital, but the board had decided that it was more prudent and more in accordance with sound principles of finance that it should be taken, as it had been, out of revenue. When the new Act was passed seven years ago, the company had expended £60,000, and since that time they had expended £70,000 more, so that although they had paid the full amount of dividend in the interim, they were only £55 worse off this, than they were the previous half year. That was some cause for congratulation, and they might rest satisfied that the company was tolerably prosperous. A sort of promise was probably held out in the last report that by this time the directors would have fully completed the works which were then in progress, but if that promise had not been fulfilled, they asked the shareholders to look at the great amount of important work already accomplished, and if it was not all finished it was progressing rapidly. The difficulty of their work was almost unparalleled; it all lay 16 feet in water, and step by step they met with opposition in every form in the matter of negotiations. Surveyors and trustees of roads and bridges, and directors of railroads and canals, they had on every hand to consult; and to give them notice when they were perfectly prepared to enter into any special work, in order to allow them an opportunity to control and superintend it. It was not the amount of work which they had to do, but the character of it, which was so embarrassing. It was not in the nature of things that such progress could be made in water-works operations as in other enterprises, and therefore it was impossible to state the exact time when the works would be completed. At the same time the proprietors would perceive that the mains were laid from Breadsall to St. Mary's Bridge, and again to Littleover, and it was only the distance through the town that remained to be completed. The pipes were being delivered satisfactorily, and all the works had been so far carried out to the entire satisfaction of the engineer. He might remind them that up to the present moment not an accident of any account had occurred amongst the workmen, which showed care, efficiency, and attention in every department. It was beyond anybody's calculation to say when the works would be finished, though they were far advanced towards completion, but the difficulties with the workmen were very great. Some of them were demanding 10s. a day from the embarrassed contractor, and if the board were to interfere too precipitately in requiring the completion of the contract very likely they would occasion far greater loss and difficulty than otherwise would be the case. A great amount of work had been accomplished; and in a very short time the operations would be brought to a close. He hoped, therefore, the shareholders would consider that sufficient had been done to warrant a continuation of their confidence in the directors, which might be exhibited by their acceptance of the report and balance-sheet, and by their endorsing the desire of the directors that they should be adopted.

Mr. Huish seconded the motion.

The Chairman, in reply to a question, said the bankers charged 5 per cent. interest, and although there was no doubt that many of the shareholders, would be very willing to pay money in anticipation of calls, on condition of being allowed 4 per cent., the directors had fully considered the subject, and also submitted it to persons whom they believed possessed considerable judgment, and they came to the conclusion that if that system was adopted it would cause them to call up at once, a considerable amount which would of necessity lie at the bank to their account, for which only 2 per cent. would be allowed, and this would have been a disadvantage rather than a benefit to the company. The sum of £64,000 was the amount which would have been called up. The bankers advanced money to any reasonable extent when it was wanted, and if the shareholders would consider the matter fairly they would not imagine that any real error of judgment had been committed. At any rate it was subject to consideration, argument, and future review.

The motion for the adoption of the report was then put and carried.

The Chairman then moved that a dividend be and hereby is declared for the half year ending the 30th of June of £1 5s. on the original shares, being at the rate of 10 per cent.; of 6s. 1½d. on the £12 10s. shares of 1868, being at the rate of 7 per cent.; of 1s. 2d. per share on the £25 shares of 1875, being two months interest at 7 per cent. on every £5 per share paid up, and 7d. per share on the £12 10s. shares of 1875, being interest for two months, at 7 per cent. on each £2 10s. paid up; in all cases free of income-tax; such dividends to be payable on the 1st of September.

Mr. Bakewell seconded the motion, which was agreed to.

Mr. J. W. Baker proposed a vote of thanks to the chairman, directors, and auditors for their services during the past half year. He said they would all appreciate the pains which their chairman took to satisfy all inquiries which were made, and the unremitting attention which he devoted to the affairs of the company, this remark also applied to the directors, and he hoped they might long be able to retain their services.

The Hon. W. M. Jervis seconded the motion, and observed that the report showed the amount of labour which had devolved upon the directors during the past and preceding half years. On some future occasion he intended to propose that the directors should receive some extra remuneration, because he did not think they now received such an amount as they ought to when the works were completed.

The motion having been passed,

The Chairman said it was only fair to remark that it had required very considerable time, labour, and attention on their part to conduct the affairs of the company, and he felt exceedingly glad that so far the progress of the work they had undertaken had been satisfactory. A large step had in fact been made towards completion, and he sincerely trusted that at the next meeting of the company the works would be finished, though if they were not it would not be on account of any want of supervision, care, and attention on the part of the board. Their exertions were not likely to be withdrawn, but would be encouraged and strengthened by the kind and good opinion which the shareholders had expressed at that meeting.

The proceedings then terminated.

AMERICAN GASLIGHT ASSOCIATION.

The Third Semi-Annual Meeting of this Association was held at Washington (D.C.) on the 12th of May last—Mr. W. H. Price, of Cleveland, first Vice-President, in the chair. There were about 75 members present, and 20 new members were elected.

The President, in his address to the meeting, said: I am very happy to see so large and so intelligent a representation of the gas interests of the country as we have in this room at this moment. I perceive that a large number have come from New England, and they are also coming in from the South, and our list will now show, not a complete, but a very full representation of the gas interests of the United States.

When we laid the foundation of this association, some two years ago, in the city of New York, it was a very small beginning. It was with a great deal of misgiving and a great deal of doubt on the part of many—in the first place, whether it was expedient; and in the next place, whether it could be made to succeed. Some of us had faith. We believed it expedient, and had faith that it could be made to succeed; and I think that the large assemblage of delegates whom we have before us to-day from the gas companies of the country, indicates that we have made very great progress in the period since our first organization.

I think there is everything to encourage us to go forward and make this a permanent institution, if I may so call it—a permanent gas association, having always in view the fundamental purpose for which it was organized—*mutual improvement in the art of manufacturing and distributing gas*, as well as in the performance of the various other duties connected with the conducting of our business.

I suppose there has never been a time in the history of this country when there has been as much agitation on the subject of gaslight, and the method of obtaining cheap gaslight, as at the present moment. I think this is fully due to the fact that the times are considered somewhat hard, and gas bills are bearing somewhat severely upon consumers in our different cities and towns. I presume the experience of every man managing a gas company at this moment is that there is an unusual number of complaints, and that there has been, during the last winter particularly, an unusually large number, in regard to the size of the bills.

This does not grow out of the fact that the bills are any larger than they have been heretofore; but I think it is from the fact that it is more difficult to pay bills—more difficult for the consumer to raise the money, and he feels the bill more than he felt it some years ago, and makes more complaint. In every direction we hear the cry, "Give us cheaper gas." Of course, attending this are numerous efforts to start new companies, and the people of many cities are inclined to believe that the way to get cheap gas is to set up an opposition company in the city in which the gas is desired to be cheaper.

I shall not enter into a discussion of this question, and will only say that I think the public attention is now aroused more to the importance of having cheap gas than ever before, and that here comes in one of the necessities of our organization; that we may learn what is the best material to use, what are the best methods of manipulating that material, and how we can, in the first place, produce our gas cheaply; and, in the next place, ascertain the best method of conducting our business, so that we may sell it cheaply, and so that the people may really have better light in their homes and streets than they ever had before, and have it at the lowest possible rates.

These are really the purposes of our organization. I hope we shall bear those purposes in mind, and make every movement in this convention, every motion, every speech, every remark, to bear upon these points.

The Secretary (Mr. C. Nettleton) then laid before the meeting a statement as to the financial position of the association.

NAPHTHA GAS.

At the last meeting of the association, a committee, consisting of Messrs. Neal, Cartwright, and Clegg, was appointed to make investigations, and to report to this meeting on the value of naphtha gas, as compared with coal, with

special reference to the following points—first, as to the cost per 1000 cubic feet for material; second, for labour; third, for cost of purification; fourth, wear and tear of retorts; fifth, the cost per 1000 for gas at the consumers meters, calculated on gas paid for at consumers meters; sixth, the rate of wages; seventh, amount of capital required per million feet of annual make to construct works for naphtha, as compared with that for coal.

Mr. NEAL now made a verbal report on the subject. He said, at the time the committee were appointed, he was quite enthusiastic as to the result. He had an idea, or was strongly impressed with the belief, that there would be some method or process discovered by which gas could be manufactured at much less cost than at present by the aid of naphtha or petroleum; but since then he had been disappointed in his investigations. He did not say that the committee looked upon it as decided that naphtha gas was a failure. By no means; they had no right to suppose such a thing. But the committee first relied upon the result of the manufacture of naphtha gas, or of naphtha gas in connexion with coal gas, upon what might be done at the Citizens Gaslight Company of Brooklyn. They looked upon that company as the great champion of naphtha gas, and when they heard that the company had abandoned it—at least for the present—they were disappointed. He understood that various reasons were given why the process was abandoned. At some other works—the People's, for example—it was supposed that the results of the process were satisfactory, but the committee found that there also it had been resolved, for the present at least, to manufacture gas from coal. Although the committee were disappointed in the result, they still hoped that some method would be presented to them which would be perfectly satisfactory. It was not because some particular processes had not succeeded, that the manufacture of gas from naphtha or petroleum might not be achieved. Acting as he did for the Charlestown Gas Company, apart from his position as a member of the committee, he felt it his duty to try all proper means to make the discovery, and to find, not, perhaps, a substitute for coal entirely, but of something that might be used in connexion with coal, in order to lessen the cost of the production of gas. Having this interest in the question, he was not desirous that the committee should make a final report on the question, which report might be unfavourable. So far as the committee were concerned, they would be perfectly willing, and indeed glad, to be relieved from the duty imposed upon them, and give it over to some others. It seemed to be necessary, in order to the preparation of a full, complete, and exhaustive report, that the committee should personally inspect some works where naphtha gas alone was made, or that they should be empowered to employ and pay a competent person, on their behalf, to make such an investigation. There was at the present time too much opposition to naphtha gas, simply because it was a new thing; and it might be, for all he could say to the contrary, that it would turn out to be a failure. But, though the committee had been unfortunate in their investigations hitherto, or had been disappointed, he did not think it would be right for them, or for the association, to abandon the subject. There ought to be further inquiry, so as to test the matter fully. In the Harlem works gas was manufactured principally from coal, but naphtha was used as an enricher; and the question came before them whether such a use of naphtha would be of benefit to the companies and to the consumers. He understood from gentlemen connected with the Harlem Company that the results were very satisfactory. In the Newark works, he understood they had been using naphtha, and also making an air gas, as it was called. Some members of the committee visited Pennsylvania, where clear petroleum gas, or naphtha gas, was used, and the light it afforded was very good, and gave satisfaction. The difficulty there seemed to be that it was necessary to charge too high a price for the gas, although it might be four or five times better in quality. There were other works where naphtha and petroleum was used alone. After again apologizing for the absence of a report from the committee, Mr. Neal said he had been instructed by them to ask for the expression of the opinion of the meeting on the subject, and that further time might be given them if it was generally thought desirable to continue the investigation.

After some conversation, and the discussion of several motions, it was resolved—"That the committee be instructed to report at the next annual meeting of the association such facts as they may obtain in regard to the process of the manufacture of gas from naphtha."

Mr. NEAL then said, as some remarks had been made which were not very pleasant to the committee, who had done their duty as far as they could, he requested to be discharged from further connexion with the inquiry.

Several members expressed their regret at such a request being made, and

Mr. NETTLETON said he thought the association had selected the best committee they could possibly have obtained from their whole number. The object sought by that investigation was to ascertain whether gas could be made from naphtha for a less number of dollars and cents than it could be made from coal. That fact was what the members of the association wanted. The committee, to his knowledge, had spent a great deal of time, and a great deal of thought and labour; and no member present, if he knew what had been done by them, would cast the slightest reflection of want of diligence in their office. If a new committee was to be appointed, he did not know how they could select members who would command so well the confidence of the whole association, and the confidence of the gas interests of the country, as the present one. This committee had made a large investigation. They were in possession of many facts. They were in possession of the general field, and as the object sought, by the motion just carried, was that the committee should report such facts as they had obtained, he thought it was wrong to say that they had not been diligent. The subject they undertook to investigate was larger than any man supposed, until he undertook to do it himself. There was more of it; it was of great magnitude, ramifying in all directions. It was a new field to be travelled over, reaching out this and that way, and every man was searching for the best and most accurate information he could get. He trusted, therefore, that Mr. Neal would withdraw his request, and consent to continue to act on the committee, that the association might have information which would be of benefit to the whole interests of the country, and of other countries also. He did not suppose that the making of gas from naphtha was yet matured, but it was making progress from day to day; and the question would come up finally and be settled, whether it was better for one man in one place to make gas from coal, and for another man in another place to make it from oil, or whether the two should be combined. This was a field in which knowledge was making progress from day to day, from year to year. What was the practical information of to-day, or what is known to-day as a fact, might be left far behind in the next six months, and it was for the committee to ascertain and report that fact. If the association could better themselves, he had nothing to say, but it did seem to him that they would be making a retrograde movement to change the committee.

After some discussion, Mr. BEATLEY moved that the resignation of Mr. Neal be not accepted, which motion was carried unanimously.

The PRESIDENT said he wished to say personally that he hoped Mr. Neal would accept this as a sufficient apology for anything that might have been said which looked like a censure upon the committee, and that he would cheerfully serve, and bring in such a report as he was able to make at the next annual meeting. He (the president) appreciated very fully the immensity of the labour the committee had performed. He once gave his attention to this question for three or four months almost consecutively. When the system which was vaunted so loudly was set in motion at Saratoga, when naphtha was held out by the *American Gaslight Journal* as being the great thing which was to take the place of coal as a material for making gas, he made a journey to Saratoga and investigated it. He afterwards paid 25 dols. to have a canvass made of the consumers in Saratoga, to see how they regarded that gas, and he had corresponded very extensively upon this question. He therefore knew something of the greatness of the work which Mr. Neal had upon his hands, and to have discharged him now would have been, he thought, to have wasted all the labour which he had heretofore expended. He therefore hoped that Mr. Neal would consent to remain on the committee as its chairman, and bring before the association, at its next annual meeting in October, the results of what he had already done, and what he might do in the coming six months.

Mr. NEAL, accepting the resolution as a token of the confidence of the association, withdrew his resignation.

SUNDAY LABOUR IN GAS-WORKS.

Mr. WALKER (Milwaukee) then read his paper on "Sunday Labour," at the request of several of the members of the association.

[This is the same paper which was read by the secretary to the association at its meeting in October, 1874, Mr. Walker being unable to be present at that time. It was published in the proceedings of that meeting in the *American Gaslight Journal*, vol. xxi, pp. 181-2 and on pp. 135-143, inclusive, of the "Proceedings of the Association." It was also published in this JOURNAL, vol. xxiv., p. 829]

Mr. HARBISON said he could endorse all that had been said by the writer on the subject of Sabbath observance at gas-works. The practice had been faithfully carried out in their works, and on behalf of the men, he would state that it was true they did better during the six days of the week, in consequence of having the Sabbath rest. Their own desire for one day in seven urged them on to do their best in the production of gas. His company did not find that, as a company, they made a less per centage of earnings because they observed the Sabbath. The men were not of a class who got intoxicated on Sunday, because they were not at work, but they attended the church to which they belonged. And he went further than Mr. Walker had gone, and maintained that the manager of a gas-work, in his opinion, did not perform his whole duty to the men employed by him if he simply, once a week or once a month, paid them their wages. It was his duty to look after those in his employ as much as he could. In regard to the subject of intemperance in gas-works, he did not think that gas-workers were a more intemperate set of men than those in any other calling, and he spoke from personal experience, in having charge of the works in some respects. There had not been, among all the men employed by the Hartford Gas Company, but two single exceptions which had come to his knowledge, within four years, of an *employé* becoming intoxicated. One had been repeatedly reproved, and was finally discharged. The only other exception was a stoker, who was now under probation, having fallen once in four years, and that fall was some six months ago or more. That was not because he was off work on the Sunday, but because he had more money in his pocket than he had been accustomed to handle for a long period. In regard to the work of the benches, they do not allow the heat to increase over working heat on the Sabbath, because they were shut down. They carefully adjusted the dampers so that the heat of the benches might not be increased, and then the general rules laid down by Mr. Walker were carried out—of stirring up the fires a little while before charging, and having them in good condition before the retorts were drawn. Of course, it was understood by members that the charge was left in the retort, during the time they were not making gas, until the time of beginning again. But he thought that managers of gas-works were very greatly to blame personally if they were not able, as many of them said they were not, to introduce this system of the observance of the Sabbath. He knew there were some gentlemen connected with this association who had said that, if there were any laying off to be done, they would prefer to do it on Monday morning rather than on Sunday, because that was a better day to get another class of workmen to make any repairs that might have to be made in the works. That was not a sound theory and principle. He did not believe in making gas on Sunday, and letting the men have Monday for recreation; and he thought it would lead to intemperance and various other evils, besides being wrong. He could not conscientiously keep men unnecessarily at work on the Sabbath, and satisfy his conscience that it was right, and go to church himself if he chose to. It was a duty he owed to them to give them the privilege of going. In comparison with other cities similarly situated in respect to the cost of the raw material, he knew that his company made as much per centage on their capital and business, with about a corresponding consumption and cost of coal, the current expense not varying much from theirs, and yet they only worked six days in the week and observed the Sabbath. He did not think it ought to be considered simply as a question of dollars and cents. If a manager of a gas-work could so manage his works as to pay his stockholders a fair remuneration, they ought to be satisfied; and he believe that he could do it, and at the same time furnish gas to the consumers at a rate at which they would be satisfied, still observing the Sabbath. Remarks had been made as to the comparative cost of kerosene and oil gas. He was a little afraid that gentlemen would find they were themselves to blame when their consumers dropped from gas and took to the use of kerosene oil; and this running their works seven days in the week, and making their men mere machines to wear out in a few years, had a good deal to do with it. He believed that they would have a better quality of gas from the same material, by running six rather than seven days, and that Providence would bless all efforts in that direction. This matter of consumers taking to the use of kerosene was, he feared, because some of the companies might be too grasping, and want to make too large profits. They did not keep their gas up to the standard that they should. If there was a little more attention paid to that there would be less kerosene used. He knew the question of storeage had a great deal to with it; but if they could go through a winter's consumption with their storeage capacity, and if in some works it might be necessary to work on the Sabbath in the winter because of the very short amount of storeage, that reason could not hold good in the summer season, when the consumption was less. There was sufficient capacity of storeage to give the men at least half the time on Sunday during two-thirds of the year, if there was storeage sufficient to carry on works successfully during the other portions of the year. For that reason, therefore, he thought that managers and superintendents generally should introduce the system. If the variation of temperature of the retorts was not allowed to change much during the time of laying off, the leakage would be very small indeed, and the quality of the gas would not deteriorate in consequence. A great deal might be said on this subject, and he hoped that members generally would speak about it. It was a matter of great interest, and it involved a duty which they owed to themselves and to their workmen that it should receive more attention.

Mr. DENNISTON said he had been very much pleased with the article read by Mr. Walker; and was gratified to know that he was satisfied that morally and financially the practice referred to was a success. There were some questions, however, which might arise as to the statements made by Mr. Harbison, respecting the amount of gas that could be made in six days. He did not, however, propose to discuss them. He merely wished to say that he did not think Mr. Walker would charge upon all those who did not dispense with Sunday labour that they were misers, for there were those who could not get along except by working on the Sunday. Mr. Walker seemed to put them all in one class; that they were not the right kind of people; that they were misers, and that it was simply for the money that was in it, or something worse than that. He (Mr. Denniston) did not think that was the case, for there were some

who were obliged to work on account of their scarcity of capital, and consequent scarcity of holder capacity.

Mr. WALKER said he did not attribute any mean motives to any one, but he was still of opinion that if a gas engineer could get along through the winter by Sunday labour, he could dispense with it in summer, even if his storeage was not just what it ought to be. If a great many more would try it they could do it very easily.

Mr. ALLEN said it was only fair to presume that all the companies represented desired to do the best they could for their men. He did not apprehend that anybody kept his men employed on Sunday merely for the sake of making them work, although some companies might be so situated that they could not tide over Sunday without more labour than was necessary with others. He supposed there was no company who could absolutely and entirely dispense with Sunday work in some form or other; but the question was whether all that was required could not be done with a less amount of labour. Indeed, it seemed to him to be narrowed down simply to the mode of furnishing gas over the Sunday with the least amount of labour to produce that result. The old form of making gas from coal has been so long in use, that it was wholly unnecessary to comment on it. A certain amount of labour was absolutely necessary for the purpose of continuing the work and producing the result. Talking about having storeage enough to last over Sunday, that would be one of the heaviest taxes that companies could very well impose upon themselves. He had under consideration a process which he had been much interested in, and followed up with an earnest and sole desire of bringing the question to a successful result. If he could satisfy a gas company—and he had great confidence that hereafter he should be able to do so—that with one-third of the labour they could produce a better gas, and that on Saturday night they would have nothing to do but just, as the boy said, "let her run," he thought that would touch very closely upon this question. In answer to the remarks of Mr. Walker, he felt it was due to the great body of the people engaged in the manufacture of gas to suppose that they did their utmost to lighten the labour of their men on Sunday just so far as they were able to do, and furnish their customers with the required gas. He did not believe that, unless they went to a very large expense in providing an unusual quantity of storeage room, they could do very different from what they had been in the habit of doing for years past. But if they were enabled, by another process, to reduce their labour to a third, the difficulties in the way of a satisfactory solution of the question would be removed. The process he referred to was that of making gas out of water, a true scientific mode of making gas. He would not speak of the expense now, because probably it might be decided not to be in order; but when the time arrived there would be no difficulty in any one who desired it, keeping the Sunday as a day of rest.

Mr. FORSTALL said, after an experience of years in the city of New Orleans, he could confirm every statement that Mr. Walker had made as to the advantages to the men and to the company. He tried last year, after the 12 months was up, to find out how much more the gas had cost his company, dispensing with Sunday labour, than it had the previous year, and he thought he made it to be about one quarter of a cent. per 1000 feet. The gas was just as good; the men were all in better condition and better pleased, and the yield on Saturday night was so much greater than it was on other nights, as almost to make up for the deficiency of supply on the Sunday. Those were the main points, so far as the gas companies were concerned. There could be no doubt that the men were benefited, and if a gas company could benefit their men without suffering themselves to a material extent, he thought it was their duty to do so.

Mr. HARBISON wished to say a single word more in regard to the suggestion of his friend from Pittsburgh, that every company could afford to furnish the increase of storeage capacity, by saying that the yield gained from observance of Sunday, in results obtained, would very soon pay for the increase of storeage necessary. And in reply to what Mr. Allen had said in regard to reducing labour to a minimum by a certain mode of making gas, instead of reducing it to 33 per cent., as he suggested, it had been reduced in his works to 9 per cent., as compared with other days. Two years ago last winter, with the working force including day and night men, 44 men ran 22 benches, and their largest consumption was 425,000 cubic feet in the 24 hours, and this last winter, with a consumption of 475,000 feet, or an increase of 50,000 cubic feet over two years ago, the work had been done six days in the week with the largest number of men at any one time employed being 30, as against 44 previously. The largest number of benches lighted in their works during the past year was 15 benches of six retorts 14 by 22, 9 feet long, and the fifteenth bench was only lighted for three weeks during the holidays.

The PRESIDENT asked whether the last speaker attributed his ability to reduce the labour so largely to the fact of his Sunday observance.

Mr. HARBISON said it in part resulted from that.

Mr. NEAL considered that the attention given to this subject was very honourable to those companies who had instituted the practice of securing a better observance of the Sabbath, and which was the case with most of the companies. The company he represented, he believed, could not dispense with Sunday labour just yet, with their present storeage, although nobody would be more pleased to do so than he would be. He always felt sorry that the men were at work while he was at church. Still they had an opportunity every fortnight on Sunday to attend divine service, and they did so. He moved a vote of thanks to Mr. Walker for his paper, which was unanimously adopted in the following form:—"Resolved, That we have listened with pleasure to the report of Mr. Walker upon the question of dispensing with Sunday labour in gas-works, and to the remarks made by him in relation thereto, and we recommend to the managers of gas-works to test the feasibility of Mr. Walker's views."

Mr. T. FORSTALL (New Orleans) read the following paper

ON THE PROPER PREPARATION OF LIME FOR USE IN THE PURIFICATION OF COAL GAS.

How wet should lime be when in the best condition for use in dry lime purifiers, is the question I propose to consider in this paper.

The chemistry of lime purification has been almost exhaustively investigated of late years, under the spur of the restrictions imposed by Parliament upon the English gas companies in respect of the "sulphur" impurity.

The reports of the London gas referees, and the subsequent discussions between Messrs. Evans, Patterson, Anderson, Mann, and other eminent engineers, have thrown a clear light upon the proper method of operating a series of lime purifiers, so as to obtain the most thorough elimination of all the impurities removable by lime; but with regard to the preparatory manipulation of the hydrate—a radical point—upon which depends, primarily, the success of any system of operating the purifiers themselves, nothing has been written during this long controversy. Indeed, throughout the whole literature of gas manufacture, this important question has been strangely neglected.

From the invention of dry lime purification, in 1817, down to, and excepting only, the two latest treatises on gas, successive writers have contented themselves with a few lines of vague directions, altered, but not improved, from the original specification of Phillips. Schilling is the first to insist upon the importance of proper preparation, and points out the error of the mode commonly employed; but his directions are insufficient to secure uniformity of results in daily practice, and his method too clumsy and tedious for American habits.

Going back to the origin of the change from wet to dry lime purification, the inventor, Reuben Phillips, in his specification, dated July 19, 1817, describes the *modus operandi* in these singularly precise and intelligible words:—

"I take any quantity of well-burnt lime, and pour water on it till it falls to powder. I then mix it with a further quantity of water, in order to bring it into such a state that the particles of lime may adhere slightly to each other; but not to such a degree as to prevent the free passage of the air between them."

Now, in what manner have the text-books transmitted to us this testimony?

Clegg, in his first edition (1841, page 114), writes:—"In preparing the lime for the purifiers it ought to be beaten, well sifted, and water added, *until by compression in the hand the lime will just adhere.* If any lumps remain, their outside only will be acted upon." The words which I have italicized were afterwards modified; and in the last edition of the work (1868, page 198) are made to read:—"Until by compression in the hand it will retain the form thus given it." A distinction without a difference to an ordinary reader; and yet with a most perplexing difference to the inquiring mind; for the first formula, although not expressing the best condition of the lime, is clear, and easily carried out. But the second really expresses nothing definite, for when sufficient moisture has been added to the slaked lime to make it retain the form assumed upon compression, more and more water may be added, and the lime will still retain the form given it, long before it becomes pasty; so that a hydrate weighing 60 lbs. to the bushel measure would conform with this condition just as well after an addition of 30 lbs. of water, although the purifying power would be entirely changed. Besides, Phillips says nothing about adhering under compression in the hand. The lime is to be wetted until its particles will adhere to each other spontaneously; and the limit of moisture is merely dependent upon the free penetrability of the mass by gas.

Peckstone disposes of the question in two lines (1841, p. 245). He says:—"Fresh slaked lime so far wetted as, on trial, not to adhere to or discolour the hand." Here, again, the range of moisture which will comply with his conditions is too extensive for uniformly good results.

D'Hurcourt (1863, p. 289) merely mentions the fact that, "for dry lime purification, the lime is slaked and spread over the grids of a purifier to a thickness of about six centimètres."

Schilling (1868, p. 75) writes:—"The degree of moisture is of the greatest importance. In many works the rule is to slake the lime in such a manner that it will neither fall into powder, nor adhere to the fingers when compressed. . . . In this condition, however, the lime is too dry; it causes much pressure."

"It is hardly possible," he adds, "to indicate precisely the quantity of water required for a given weight of lime, but there will be little danger of error in operating as follows:—Spread the quick lime over a stone floor, and surround it with a slight dyke of slaked lime, to prevent the water from running off; then slake it with water thrown upon the mass with pails, but not with a hose. It is then to be well mixed and turned over, until the whole forms a thick and homogeneous mass. It must then be thrown in a heap and left undisturbed until the next day . . . when it must be again worked over, and the lumps broken. In this manner a dense mass is obtained, which does not run together, and of which all the small lumps are well detached from one another. The layers should be from 5 to 8 centimètres in thickness, and the fragments of lime of the size of filberts." I have here translated, with slight omissions, the whole passage relating to this subject—first, because Schilling's is the only book which contains detailed practical directions; and, secondly, because his work is not yet accessible to English readers, although an excellent French translation has been published in Paris. We come now in chronological order to the "Treatise" which is being published in weekly parts in the London JOURNAL OF GAS LIGHTING, and which promises to supply the need long felt in our profession of a work embodying the results of the best thought of the past ten years upon all subjects relating to the business of gas lighting. The author (J. G. L., vol. xxiv., p. 633) shows a clear appreciation of the prevailing errors in the manipulation of lime, inculcated by Clegg and Peckstone. "Notwithstanding the clearness of description in Phillips's specification," he writes, "there are few processes in gas manufacture which have been so imperfectly applied as dry lime purification. The term is certainly a misnomer, and no doubt has frequently led to the improper application of this method of purifying; for the writer has often witnessed it employed literally as dry lime, and sometimes carefully sifted prior to being placed in the purifiers. Lime, when thus employed, is almost useless . . . but when well moistened, and in such a state that when pressed in the hand it possesses an almost doughy consistency, it is used to the best advantage."

These extracts contain all the information upon this subject to be found in the text-books from 1817 to 1875. They are contradictory and dogmatic, leaving, just where Phillips left it, the question which I have proposed for discussion here to-day—"How wet should lime be, when charged into the purifiers, to give the best results?"

That it is an important question is manifest from published reports of gas-works, both in England and America, in which the duty of a bushel of lime is seen to vary from 500 cubic feet of gas purified, through all the intermediate quantities, up to 20,000 cubic feet. And while it is true that coals vary in sulphur and limes in strength, it is also true that much of this discrepancy of duty is due to the more or less efficient condition of the lime, as placed into the purifiers of these various works; and, other circumstances being equal, it is safe to assert that this difference in moisture is the principal cause of the difference in duty.

It seems to be forgotten that the change from wet to the so-called dry lime purification was not induced by any want of efficiency in the liquid preparation, but by the desire to get rid of the terrible nuisance created whenever it became necessary to replace it with fresh material. Keeping in view, therefore, the alteration in the mode of bringing the gas into contact with the lime, made necessary by the change from the liquid to the solid form of the hydrate, the nearer we approach the condition of wet lime in our purifiers, without losing the advantages of free penetrability and comfortable handling, the better shall we carry out the intention of Phillips, and appreciate the value of his invention. Clegg's first formula, however, ignoring this truth, undoubtedly represents the common practice in gas-works at this day. Lime is slaked, and water added, until by compression the powder will only just adhere. In this state the lime will not purify one-half of the quantity of gas per bushel that it otherwise would, besides considerably increasing the resistance presented to the flow through the purifiers; and my own experience further shows that the more water the lime can be made to hold without running into paste, the less will be the resistance and the greater the duty performed. As the author of the "Treatise" last quoted aptly remarks: "Dry lime is a misnomer;" "granulated" lime would come nearer the true description.

That this conclusion has not been reached without sufficient reason will be shown by the facts which I shall now state for the benefit of any member of this association who may be wrestling with tradition in his purifiers, unconscious of the simple remedy that exists for his troubles.

During the winter of 1870-71, an average of 900,000 cubic feet of gas was daily forced through three purifiers, 14 ft. by 19 ft. square, with 10-inch connecting-pipes, at the New Orleans Gas-Works. This was at the rate of 37,500 cubic feet per hour. The resistance was such that, although in previous years the seals had been deepened from 14 to 18 inches, yet twice a day, at the hours for meals, when the charges followed closely upon one another in the retort-house, the gauge at the inlet of the purifiers marked a pressure of 18 inches. The outlet pressure was a mean of five inches, showing the resistance due to the purifiers alone to be 13 inches. It was quite a matter

of course that the water should be blown out of the cups at these times, and a man was always on guard, water hose in hand, to replenish the seals while the blowing lasted. At other times the normal inlet pressure was 16 inches. Not more than four inches of lime, in two thin layers of two inches, could be worked in each purifier, making a total thickness of twelve inches in the three boxes. Two changes daily were compulsory; and sometimes the spare vessel was hardly charged before another change became urgent. Constant vigilance was absolutely necessary for safety; and the men lived in an atmosphere completely saturated with the vapours of ammonia and sulphuretted hydrogen. Such was the daily situation for three months.

When the spring came, giving us a season of relief, I began to consider how we were to get through the next winter with its increased production. Larger purifiers were out of the question for that year, and a cure must be sought elsewhere. No suspicion had ever occurred to me that the lime was at fault, for we had strictly followed the instructions of Clegg, and our hydrate just "adhered upon compression, retaining the form assumed." But just then I received Schilling's book from Europe, and read the passage above translated. This pointed directly to the source of trouble, and placed the remedy in our own hands. We were then purifying between 8000 and 9000 cubic feet per bushel of unslaked lime, and probably would have remained satisfied with this duty, had we been enabled to reduce the pressure.

Following Schilling's directions as closely as their vagueness would permit, the first experiments were only partially successful. There was no uniformity in the consistence of the hydrate. The slaked mass would break up into irregular lumps of all sizes, from that of a pebble to that of a paving-stone, and at others assume the adhesiveness of soft putty, clinging tenaciously to shovels and boots and barrows, and almost impervious to gas.

After several weeks of experiment, generally unsatisfactory, but with now and then a stroke of good luck which showed clearly the lurking possibilities of the new departure, we struck upon a simple and effective means of gauging the proper degree of moisture, and securing its uniformity throughout the whole charge of lime operated upon. This was to pass the slaked lime through a wire screen, with an open mesh of one square inch area, placed at an angle of 70° with the floor. This screening reduced the lumps into granular pellets of irregular form and size, the largest of which did not exceed the bulk of a small hickory nut. The proper degree of moisture was found to be that beyond which any excess would cause the "dough" to adhere to the screen instead of breaking through. Slight variations of moisture, in different portions of the charge, were corrected by the thorough mingling of the whole in the screening. The pellets did not adhere to one another spontaneously, but could be shovelled into barrows and reshovelled into the purifiers, without losing their independence; but the slightest compression and working in the hand would resolve them immediately into adhesive putty.

This was the key to the desired solution, and not a charge was afterwards missed. The advantage of the screen over Schilling's method of breaking the lumps by hand lies in the saving of labour and greater uniformity of results. The benefits of wet lime were immediately made manifest in the purifiers. The pressure fell several inches, and charges became less frequently necessary. As the men became accustomed to the work, the results improved from month to month, and by the time winter returned we were no longer in any fear of it. The maximum daily production of 1,100,000 cubic feet flowed easily through 27 inches of this wet granular lime, under an inlet pressure of 13 inches, in the same purifiers which had refused passage the previous winter to 1,000,000 cubic feet through 12 inches of dry lime, except under a pressure of 18 inches; while but one daily change was required instead of two.

In the following spring the thickness of lime was increased to 36 inches, in layers of 4 inches; and finally, in 1873, to 54 inches, in layers of 6 inches; and this thickness was maintained with but slight increase of pressure throughout the winter of 1873-4. Not until Dec. 6, 1874, was the gas turned into larger purifiers; and up to that day every bushel of lime used in the old boxes during the eleven months of that year had purified 20,000 cubic feet of gas; while the charges were still further diminished in frequency to once a week in summer, and twice a week in winter.

To exhibit at a glance the increase of duty per bushel, and the reduction of pressure, I have compiled from the station reports the following table:—

Year.	Average Daily Production for December. Cubic Feet.	No. of Layers of Lime worked thro'.	Total Thickness of Lime. Inches.	Maximum Pressure at Inlet of Purifiers. Inches.	Mean Pressure at Outlet of Purifiers. Inches.	Cubic Feet of Gas Purified per Bushel of Unslaked Lime in December.	Cubic Feet of Gas Purified per Bushel of Unslaked Lime for the whole Year.	Condition of Lime.
1870	969,000	6	12	18	5	7,752	9,053	Dry.
1871	1,010,000	9	27	13	5	11,222	10,000	Dry during half the year
1872	1,067,000	9	36	15	5	11,854	11,807	Wet.
1873	993,800	9	54	17	5	22,084	17,291	Wet.

I have placed these figures before you, not to lay stress upon the absolute duty performed by the lime during 1874, but to mark the great difference between December, 1870, and December, 1873, and the gain in these three years of nearly 200 per cent. in the purifying capacity of the lime, obtained almost entirely by the simple addition of water under careful manipulations. This economy of material was accompanied by a corresponding saving in labour in wear and tear of purifier grids. Nor was the benefit confined to quantity, but extended to the quality of purification as well. No trace of carbonic acid passed the second purifier, and the "sulphur" impurity was brought down to a range of from 5 to 11 grains per 100 cubic feet, with a mean of 9 grains.

As I said before, there can be no absolute standard of duty for a bushel of lime, except under similar conditions of coal and lime supply; and even then the difference in preliminary treatment of the gas in the condensing and scrubbing apparatus will cause a discrepancy of results in different works. But it will be easy for any manager to ascertain whether he is getting the best duty possible under his conditions of production, by experimenting a little in the direction indicated by the above facts. That there is ample room for improvement, in some places, one single example will demonstrate; and as the figures are public property, the illustration involves no violation of confidence. In the fortieth annual report of the trustees of one of the largest gas undertakings in the United States, it is officially stated that 345,550 bushels of lime were used in their works during the year 1874, to purify 1,776,268,000 cubic feet of gas, or one bushel to every 5·112 cubic feet. As the coal and lime used in their works are of the same quality as those used in New Orleans, it is fair to assume that similar manipulation would produce equal results in both cases. Taking the proper duty per bushel to be 20,000 cubic feet, the waste of lime in one year in this one city amounts to 257,000 bushels, or, at the price of 20 cents per bushel, to 51,400 dols. Add to this the cost of labour uselessly expended in slacking, charging, and discharging this excess of material, and the aggregate represents a very respectable sum.

I submit, therefore, as the result of actual experience—

1. That the granulated hydrate, containing as much water as it can be made to retain without becoming adhesive under careful handling, will purify a much greater quantity of gas per bushel than when in the dry and almost dusty state in which it is generally employed.

2. That in the former condition it offers less resistance to the free passage of the gas through the purifiers; and

3. That numerous thin layers of lime can, therefore, be advantageously consolidated into a lesser number, of greater thickness, with economy of labour and wear and tear.

The statement made by Clegg that the lumps are acted upon only on the outside, does not apply to the granulated preparation. This, on the contrary, is so penetrable to gas, that lumps as large as walnuts are thoroughly saturated, even when lying loosely upon the surface of the layers. I have here a few specimens picked up at random in the last opened purifier which will speak for themselves.

The only objections which reached me against the change in the mode of preparation did but add further proof of its advantages, and are worth mentioning.

The first complaint came from the men in the retort-house. They had from time immemorial used the spent lime for luting the retort-doors. It was soft, and made good mortar; but when the wet lime became spent it left the purifiers in the shape of solid slabs, almost as hard as stone, and to soften it in water was impossible. There was wailing among the luters, and we were compelled to purchase loam at the price of 20 cents per barrel, to replace the lime which had cost 60 cents.

The second objection came from the contractor, who purchased all our residuals at a fixed price per ton of coal carbonized. He had been in the habit of getting good prices for the foul lime for building purposes, and found his income from this source suddenly cut off. As the contract specified that he was to receive spent lime, and we were only better carrying out our obligation in delivering it as well spent as possible, he sadly resigned himself to the inevitable.

The better to illustrate the difference between the two conditions of the hydrate, I have prepared two samples for the inspection of the association. The first complies with Clegg's formula, and weighs 60 lbs. to the bushel measured. The second was taken from a charge ready for the purifiers, and weighs 92 lbs. to the bushel. There are also samples of the spent lime taken from each layer of the last opened purifier, after being in action 38 days, and purifying 24,000 cubic feet per bushel.

In conclusion, I trust that this subject will receive the fullest discussion, and that any facts which conflict with the experience above related will be brought forward at this meeting.

The discussion which followed the reading of this paper will be given nex week.

MANCHESTER DISTRICT ASSOCIATION OF GAS ENGINEERS.

The Twenty-third Quarterly Meeting of this Association was held at the Mitre Hotel, Manchester, on Saturday, the 28th of August, 1875.

In the absence of the president (Mr. Hunter, of Rochdale), the chair was occupied by Mr. LONGWORTH, past president, of Dukinfield.

The following gentlemen, being engineers or managers of gas-works, were unanimously elected members of the association, viz.:—

Mr. Bryan	Beverley.
,, Carr	Halifax.
,, Dickenson	Leek.
,, Emmerson	Blackburn.
,, Frith	Runcorn.
,, Goodwin	Rotherham.
,, Jones	Chesterfield.
,, Loam	Radcliffe.
,, M'Millan	Stoke.
,, Tindall	Walsall

A long and interesting paper on "Gasholders" was read by Mr. JAMES JACQUES, past president, of Stockport. Taking as an example a telescope gasholder, 102 feet in diameter and 32 feet deep, he advocated the necessity of a trussed roof, and the undesirability of having counterbalance weights, and pointed out the dimensions of the several parts he adopted in practice.

In the discussion which followed, so general were the expressions of the members with regard to the utility of having the paper put in print, that Mr. Jacques, in deference to the feeling of the meeting, consented to its publication for issue to the members.

The second paper read was explanatory of a "New Safety Station Governor," by Mr. WILLIAM KEY, of Accrington. With the aid of drawings and a working model, fitted up for the supply of about 50 lights, he described his invention, showing that its adoption, in preference to the common form of governor, would be attended with diminished risk. The discussion on this paper was adjourned until the next meeting for want of time.

SEWAGE COMMISSION.—The commission appointed by the President of the Local Government Board to inquire into the question of town sewage utilization are about to visit certain towns on the Continent for the purpose of inspecting and inquiring as to the modes of town sewering, house draining, and the use of sewage. They will proceed at once to Holland to inspect the pneumatic mode of drainage, as in use at Leyden and some other places. Berlin will be visited, and Dantzic, where sewage is used, and the inquiry will be directed principally to the effects of frost during severe winters on the closets, the house drains, and on the irrigated grounds. The sewers and sewage works at Frankfort-on-the-Maine, at Paris, and at Brussels are to be inspected. The details of the inquiries both in Great Britain and on the Continent are to be embodied in a report to be laid before the president, so that when the question of river pollution is again brought before Parliament he may be in possession of information as to the most recent modes of treating sewage, whether mechanically, chemically, or in agriculture. Edinburgh, Glasgow, Kendal, Birmingham, Wolverhampton, Rugby, Warwick, Leamington, Doncaster, Bedford, Banbury, and Tunbridge Wells have already been inspected.

RUTHIN WATER-WORKS COMPANY.—At the half-yearly general meeting of this company on the 28th ult.—Mr. Low in the chair—the directors reported that the quarterly amounts of water-rents, although slowly, were gradually increasing, and would increase much more if the company were in a position to extend the main to parts of the town now much in want of water. The want of capital prevented the directors from doing this. They had given much consideration to the subject, and they recommended that application should be made, during next session, to the Board of Trade for a Provisional Order to increase the capital of the company, to enable them to make an additional reservoir and filter-beds, to extend the mains to different parts of the town, and pay off present liabilities. The directors had every hope, if this were done, they would soon be in a position to pay a fair dividend to the shareholders. Negotiations were in progress with the corporation, for their sanction and approval of the application for such Provisional Order. The corporation having expressed their desire to purchase the works as they now stand, the board recommended that the same be disposed of to them for the sum of £8500, being the sum actually expended—viz., 600 fully paid-up £10 shares, amounting to £6000, and the amount of money borrowed, amounting to £2260, with about £240 liabilities. The directors considered that when the works were fully developed they would pay a very good dividend on the outlay. The works at Plas-y-nant and the mains in the town were in efficient order.

BURSTING OF CIRCULATING BOILERS AND WATER SUPPLY-PIPES IN WINTER.

By Mr. W. H. Bailey, of Salford.

[A Paper read before the Society of Municipal and Sanitary Engineers, at their Annual Meeting in Manchester, on the 2nd of July.]

Every winter in this country there are many fatal accidents caused by the explosion of what are known as circulating or bath boilers; there is also a great amount of damage done to house property, and some domestic misery created by the bursting of water-pipes, caused by the water freezing in them.

I have paid a little attention to these two subjects, which are somewhat of a kindred nature, and when I was honoured by a request from your society to read a short paper on them, I gladly acceded to it, knowing the wide-spread influence of your members, and feeling that some good would be done to society if I could only lay before you certain facts as they appear to me. I feel very diffident of my ability to do this, and hope you will bear with me if I appear tedious in describing things which may be familiar to many of you, but without doing which I might render myself obscure.

There seems to be among many people an impression that domestic boilers often explode through a deficient water supply. I believe that is not the case, and I think it will be very difficult indeed to demonstrate that any accidents have occurred through this cause. A great number of boilers burst every year which are unreported, because not attended with fatal results. Of those which have been reported during the past six or seven years, half appear to have exploded through stoppage of the circulating pipes by ice, and the remaining half have been caused by the fixing of stop-taps in those pipes.

A few years ago circulating boilers were only in existence in comparatively few large houses and hotels, but now nearly all new houses of the value of £20 per annum or more, built in this country have bath boilers, and, unfortunately, the great majority are of cast iron, of the very worst form for resisting pressure. There are two slightly different modes of fixing these in this district, which I will endeavour to describe.

The ordinary and cheap way of fixing and supplying kitchen boilers is illustrated by fig. 1. The supply of cold water is received in a cistern at the top of the house, and conducted by the "down-pipe" into the boiler; having passed through this, and having become hot, and therefore of less specific gravity, it ascends what is called the "up-pipe" to the hot-water cistern, from which it is drawn as required for use.

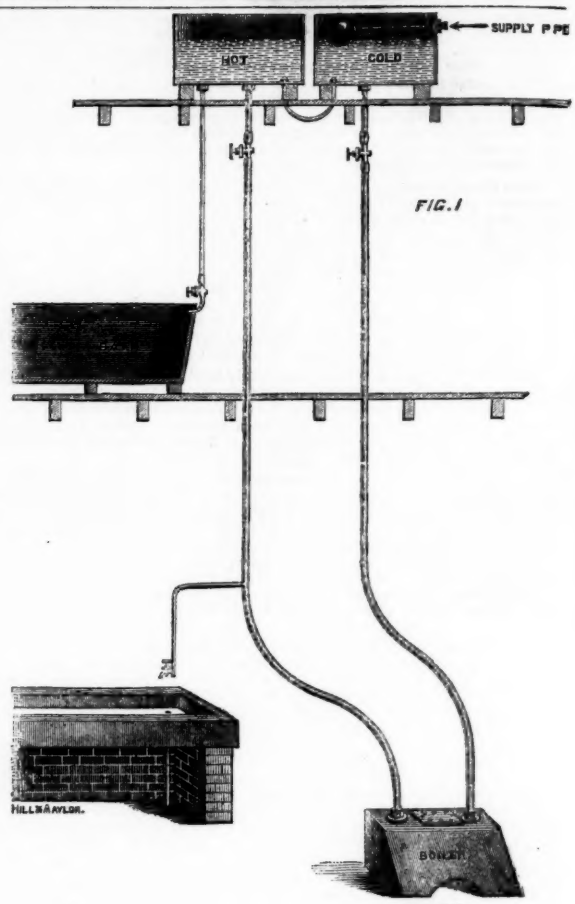


FIG. 1

It will be seen that the pressure the boiler has to sustain when filled with water depends upon the height of the supply cistern above it; 2 feet 3 inches of water in column being equal to a pressure of 1 lb. on the square inch, therefore 60 feet high will give a pressure of 17 lbs. per square inch on the boiler. As, however, most boilers are only about 30 feet or 40 feet below the cistern, we may consider that the average pressure at which they work will be about 10 lbs. on the square inch.

In good houses in this district copper cylinders are fixed in connexion with the boiler, in order to give an abundant supply of hot water, and for preventing and rendering explosions impossible; that is, if we are to believe what is told us by more than one respectable tradesman of this district. So much has been said about copper cylinders preventing explosions by men whose business it is to know better, that I will refer to it a little later on.

Fig. 2 represents the arrangement when the hot water cylinder is used. It differs slightly from the plan I have already described, the hot water cistern being dispensed with, a large cylinder, generally of copper, being substituted. A pipe is taken from the top of this cylinder, called the air-pipe, which is open to the atmosphere, and in which water ascends to the level of the cold water supply cistern. The great advantage in using these cylinders is obvious, as the constant circulation which is always taking place causes the water when cool to descend into the boiler, and, when hot, up again into the cylinder, absorbing all the heat possible for the boiler to give it, which is not the case in the simpler and less expensive mode of fixing.

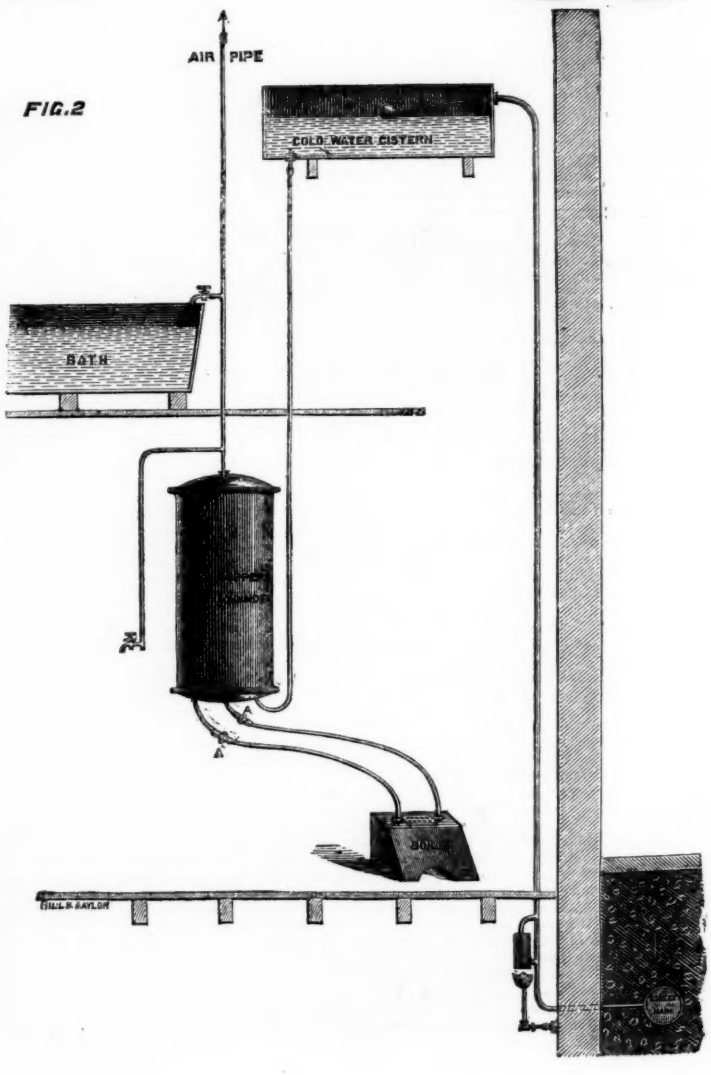


FIG. 2

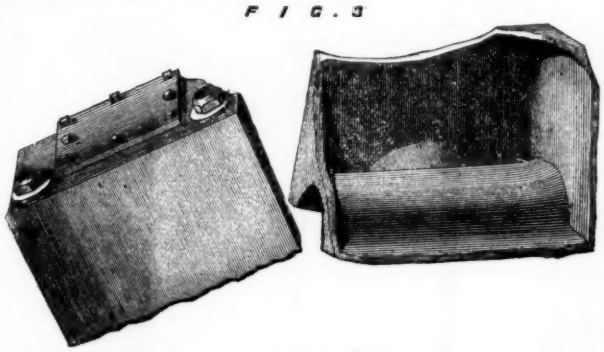
Sometimes the hot water is drawn from the top of the cylinder, and sometimes from the air-pipe. In both these systems of fixing, it will be seen that the boilers are always full of water, and that, supposing the supply of water to cease, it would not be possible to drain them dry, causing the fire to make them red hot, and thus create danger. The source of danger and death is to be found in the direction to which I have alluded; and if there is one thing at all that creates astonishment in my mind, it is the fact that I stand here in this city of Manchester and state that it is unsafe to work a boiler under pressure which has not a safety-valve fitted to it.

With the best intentions, many boilers have taps fitted in the up and down pipes, as shown on the model and drawing, fig. 1, so that, if any accident occurs to the boiler, it may be repaired or removed without fear of inundation. These taps have caused many fatal accidents in summer as well as in winter. If these taps are by any means closed when the boiler is at work, the water is sealed in the boiler, and nothing can prevent pressure accumulating unless the fire be put out. Only a few days ago I talked the matter over with an architect of no mean reputation in this district, who informed me that he would not think of permitting a good house to be fitted with a boiler which had not these taps fixed. He had ordered several houses to be fitted with taps under the copper cylinders, as represented on fig. 2. I am glad to say he altered his opinion when I explained to him the facility which he thus gave to ignorant or careless people for creating a magazine of destruction. A destructive explosion was created in the house of Mr. Pease, of Darlington, by their means some short time since; and, on the 9th of October last, at a newly-erected West-end club in London, a serious explosion was caused by them. To quote Mr. Lavington E. Fletcher, chief engineer of the Manchester Steam Users Association, who has kindly rendered me valuable assistance in giving me some facts in connexion with these subjects, the boiler was of the ordinary circulating class, connected to a cistern by two circulating pipes. Between the boiler and overhead cistern were two stop-taps; the hand-hole in the boiler had been leaking, and a mechanic having been sent for to make matters right, on examining the boiler he shut off the taps. He then left the job, taking the precaution, however, to write over the fire-place, "This fire must not be lighted." Unfortunately, this warning was neglected. The fire was lighted at ten o'clock on the following morning, and, as the outlets were both closed, the boiler burst about two hours afterwards, when the front was blown out, and the whole range shot forward into the kitchen. Fortunately, only one man was slightly injured, there being no one else in the kitchen at the time.

The fixing of these stop-taps caused the death of a young woman in January of this year. This is known as the Eccles New Road accident. As it occurred in my own neighbourhood, and in Seedley Ward, which I have the honour to represent in the Town Council of Salford, I took more than an ordinary interest in it. I was foreman of the jury convened to inquire into

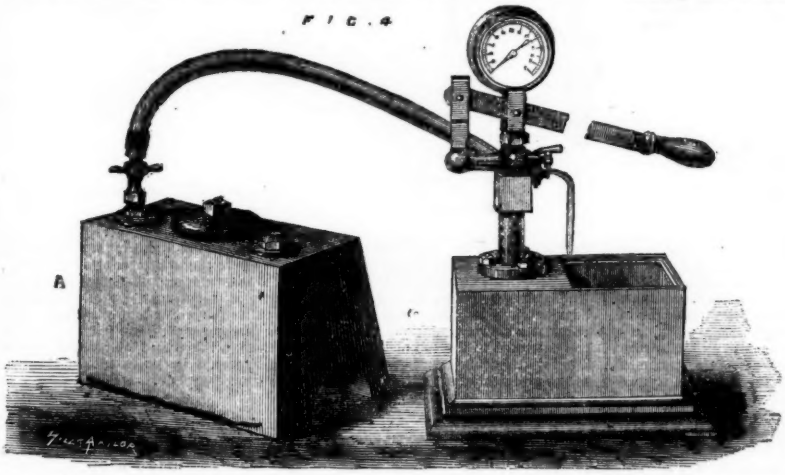
the cause of death. It appeared that the proprietor of the house, actuated by a proper desire to make his house safe from inundation, consulted a plumber, who informed him that the best way was to fix two taps, one in the up-pipe and one in the down-pipe of the bath boiler. These were placed in the bath-room immediately under the cisterns, the boiler not having a copper cylinder; they were fixed where any mischievous lad could have turned them at any time. A leakage during the thaw of entirely different pipes caused the proprietor to turn these taps off, and, having done this, he ordered the fire out. A plumber was sent for, and told to make all right; the leaking pipe was soldered, he reported all correct, but omitted to turn the taps on again. The result was that an explosion took place, which removed the ranges of the house and the one next door, making a breach in the division wall sufficiently large for any one to walk through. The window was blown out, and the poor woman was blown half way through it. No one was in the kitchen of the other house, or the consequences might have been more serious. The boiler (fig. 3) which is on

FIG. 3



the table measures 12½ inches long, 10 inches broad, and is 10½ inches high. The top and front were blown out in one piece; the area of this gives 240 inches, which, if multiplied with the 250 lbs. pressure required to burst a similar boiler, gives a total pressure of more than 26 tons. The new boiler (fig. 4) on the table has been burst by me by means of hydraulic pressure.

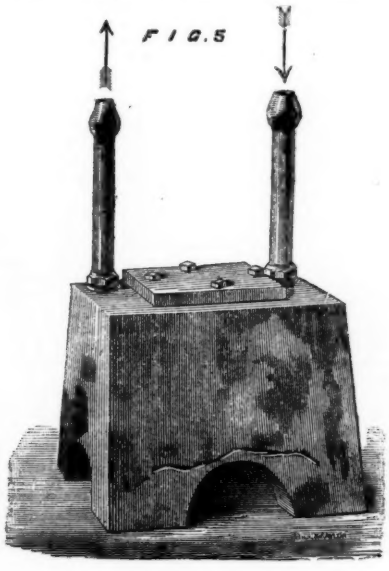
FIG. 4



I could give more details of similar accidents caused by these taps, but I think it scarcely requisite to occupy your time with them, having, I hope, proved how dangerous the practice is.

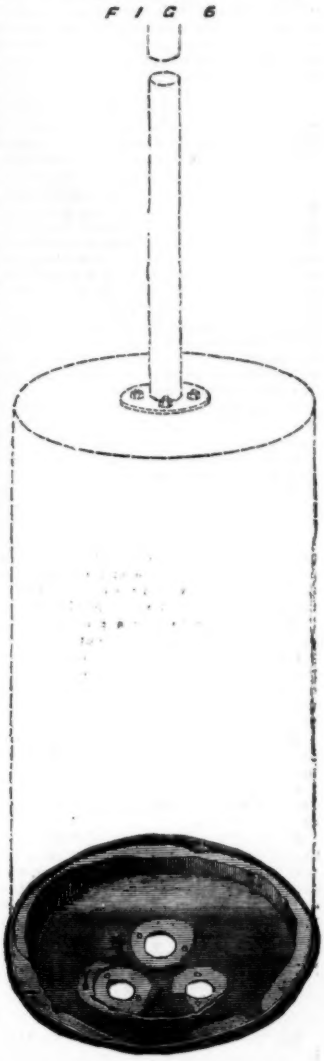
I will now proceed to those accidents caused through the stoppage of the circulation by the freezing of the water in the pipes. These accidents appear to occur chiefly when houses are entered upon by the tenants in the winter time, everything being cold, the water in the pipes being frozen. A fire is put under the boiler by the new tenant, and an explosion takes place. (Fig. 5.) In very severe weather, pipes have been known to accumulate ice in one

FIG. 5



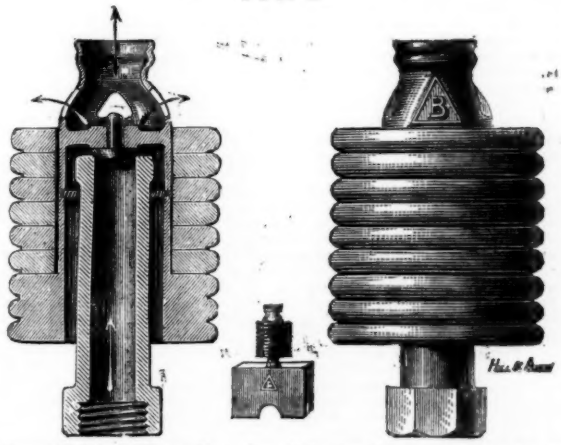
night, those boilers fixed without copper cylinders being most dangerous. Not far from the scene of the Eccles New Road accident, about two years ago, a Mrs. Cowie was killed by an explosion from this cause. The water in the boiler had longer time than usual to cool on the Saturday night, and Mrs. Cowie having got up late on the Sunday morning, after the fire had been lighted a short time, the boiler burst, and she was blown across the kitchen and down the cellar steps and killed. Another accident from a similar cause occurred near Brunswick Street, Manchester, in January this year, which nearly killed a young woman, and I believe now she lies on a sick bed through the effects. At the same date the copper cylinder bottom (fig. 6) which is on the table was blown out in a house in Pendleton; there was no one in the kitchen at the time, or they might have been scalded to death. There was another accident to a copper cylinder at Gilda Brook, near Eccles: and in the same week the boiler that was fixed to replace the one that killed Mrs. Cowie burst with an accumulation of ice, the house being empty. One occurred at Glasgow on the 25th of December, which seriously injured a man; one at Burnley; one at Chorley, which killed a little girl, on the 23rd of December. In this case the tenants had only just entered, and a fire having been put under the boiler, it burst, with the sad result I have named. On December 28th an explosion of a circulating boiler took place at Fulwood workhouse, near Preston, which killed one man and injured two others. December 30th, one at Bradford; one at Delph, December 8th; one at Ashton-on-Mersey on the 7th of December; one at Bolton on the same day, and one at Hyde about the same time. There are a great many of these accidents unreported, because unattended with death. I have found that in the neighbourhood of Seedley, where the woman was killed in January, that no less than five bursts took place about the same time.

FIG 6



Having endeavoured to show the two chief causes of these explosions, the natural question is, What is the remedy? What will prevent this destruction of life and property? I have no hesitation in saying that, if safety-valves had been fixed, every one of the accidents would have been prevented. And, as the ordinary lever safety-valve would possibly become inoperative in course

FIG. 7.



of time, a little pendulous safety-valve, of the Cowburn type (fig. 7), has been recommended, as not likely to get out of order, by Mr. Fletcher, of the Steam Users Association; and, if safety-valves were fixed on the boiler, I think there is no objection to the use of taps in the circulating-pipes, as they are undoubtedly useful in case of accident. Weak plates of white metal have been recommended instead of safety-valves, which would burst at a low pressure. I

have made extensive experiments on these plates, and have burst a great number by actual steam pressure; but I found that I could never get two alike out of the same mixture of metal. There are also many other objections to them which I will not occupy your time with.

A word about copper cylinders preventing explosions. Circulars have been issued by ironmongers, in which it is distinctly stated that these things render an explosion impossible. This delusion, which has such a firm hold in the minds of many people, demands some attention. A copper cylinder fixed to a boiler makes it safer from those explosions which are caused by ice in the pipes. It is just possible that the death of Mrs. Cowie, which was caused by the water freezing in one night, would have been prevented by one, as the hot water in the cylinder makes it a storeage of heat, which resists the attacks of cold for a longer time than a small pipe full will do. A copper cylinder only delays the danger a few hours at most in severe winters, and its utility ends at that for preventing explosions. The bottom of the cylinder on the table was blown out through one night's frost; and any one having a cylinder who wishes to have a hot bath late at night, when the servants have gone to bed, can empty all the hot water out, which will be replaced with cold, and by this simple means reduce the power of its resistance to the effects of cold. A cotton broker of Liverpool bought a small house at Southport, and went into it in the winter time. He was a widower, and required only one servant. He hired one at Southport. After putting her in his new house, he went to his business in Liverpool. On his return he found part of the boiler in his little back garden, and part of the gable end of the house blown out. He informed me that the girl was not injured, being in another part of the house at the time. A copper cylinder would not have prevented this accident; a safety-valve, at a cost of 8s. or 10s., would have done so.

I think that owners of house property would do well to have stop-taps fixed in the bottoms of bath boilers, to enable the water to run out when the houses are not tenanted. I have been informed of several that have been cracked by the accumulation of ice inside the boiler this last winter in empty houses. The one—fig. 5—on the table is one taken out of a house in West High Street, Pendleton; three others were cracked in the same street. When tenants leave in the winter time, it is therefore desirable to empty the water out to prevent this loss.

Gentlemen, I hope I have made the subject as plain and as simple as it really is; I hope I have shown to you that this destruction of human life and property is not surrounded or obscured by things which are difficult to understand; that it does not require profound scientific skill to prevent it; that we have it in our power to stop a great amount of mischief without evoking the aid of anything but the most ordinary means.

I am not here as the advocate of any new system of patented mysterious pipes, but simply to say that a safety-valve in every case mentioned would have prevented accidents. If this be true, what is the duty of the municipal authorities? It seems to me to be very clear and straight before them.

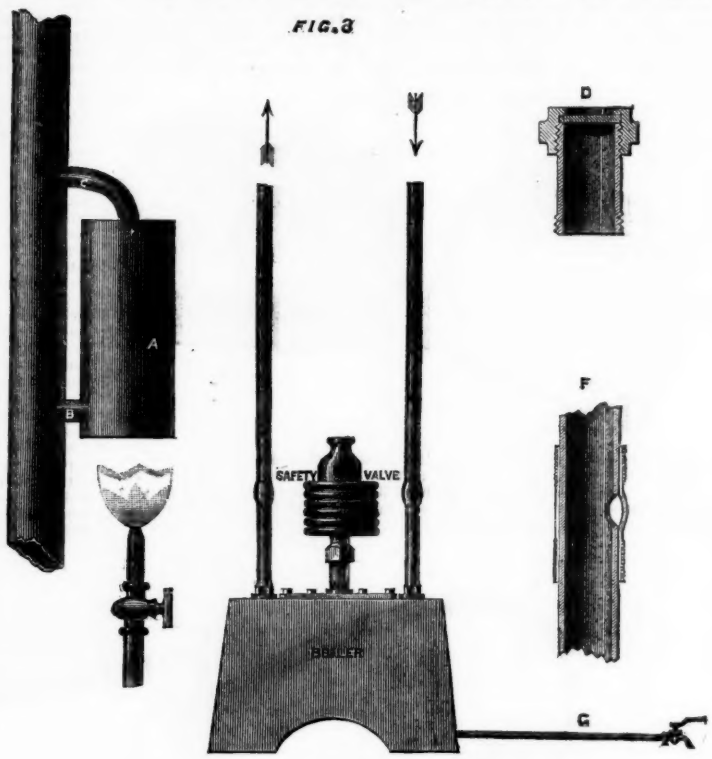
Action of some sort is imperatively needed, either by the imperial or municipal authorities, in order that these things may be fixed in a safe and proper manner.

Closely allied to the subject we have been considering is the bursting of water supply-pipes in frosty weather, through the expansion of ice.

My paper has already exceeded the time allotted, and I will shortly endeavour to describe a little plan which is not patented, and which, I think, may be used with some benefit. The social misery, without mentioning the damage to property, which takes place every winter from this cause, is great, and needs no comment. Various remedies have been suggested, but I have not been able to find that any have been successful. Elastic diaphragms, rubber balls, and many ways of creating more space in the pipes to allow the ice to expand, have been suggested, but without effect. Strong pipes will burst when water becomes ice. Hydraulic cylinders that will bear a pressure of five tons on the square inch have been cracked in Manchester warehouses by the water freezing in them. If this be so, it will be apparent that stronger pipes than those at present used will not prevent the evil; therefore, if we cannot get pipes of a material that will bear the pressure of ice, the next best thing is to prevent the ice accumulating.

This may, in some cases, be done by covering the pipes with felt, and fixing them on inside walls. As, however, most water supply-pipes are fixed on the inside of outer walls, and, therefore, very hard to become frozen up, it has occurred to me that if a little cylinder and gas-jet be used, as illustrated at fig. 8, it might keep the water warmer than freezing point, at a very small expenditure for gas. The cylinder may be about 6 inches long and 3 inches diameter, and might be fixed in the cellar at a point where the water enters the house, being connected by a small tube at each end to the water supply-pipe of the house. Under this cylinder, during frosty weather, a very small jet of gas might be constantly kept burning, which would cause the water to ascend, and thus promote a slow circulation. If, however, a separate pipe, ¼-inch bore, were to be connected to the top of the cylinder, and then taken and connected to the highest and coldest part of the water-main, it would be made more effective, as the circulation of warm water would be then complete.

FIG. 3



SOCIETE TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

The Second General Meeting of the Members of the above Society took place in the Assembly Room of the Society of Civil Engineers, Paris, on the 24th of May.

The first sitting was held at ten o'clock, when the chair was occupied by M. A. MALLET, president of the society.

The SECRETARY (M. Ellissen) read the minutes of the last meeting, which were unanimously approved of.

The TREASURER (M. Foucart) then presented the statement of accounts, which, with the report of the committee, testified to the satisfactory progress made by the society since its commencement in May last year. There were then 84 members, to which 33 were added at the general meeting on the 4th of November, making a total of 117. Of these, two are since deceased and one has resigned. The receipts for subscriptions, &c., up to Dec. 31, 1874, amounted to 5390 francs; the expenditure to the same date (including the purchase of ten bonds in the Paris, Lyons, and Mediterranean Railway) amounted to 3917 francs; leaving a balance in hand of 1473 francs. Since that date there has been received for subscriptions, &c., 3230 francs; add balance in hand, as above, 1473 francs; total receipts, 4703 francs. From this amount must be deducted for office and other expenses from Jan. 1 last, 103 francs; expended in the purchase of four additional railway bonds, 1218 francs; total, 1321 francs; leaving a balance in hand of 3382 francs, exclusive of 350 francs unpaid subscriptions. This balance will enable the committee, after setting apart a certain sum to meet current expenses, to still further augment the general fund of the society in conformity with the rules.

The PRESIDENT then recapitulated the principal points of the report, and explained the actual condition of the society, adding that the necessary authorization for its constitution had been obtained from the Prefect of Police, who, with a trifling exception, approved of the rules they had framed.

The meeting then proceeded to select four members to serve on the committee in lieu of those going out of office, and MM. Brémond, Leclerc, Vacher, and Villet were chosen for the purpose.

The names of the gentlemen who had applied for admission to the society were then submitted to the meeting, and approved of, thereby increasing the number of members to 124.

The PRESIDENT next submitted a proposition that Lyons should be fixed upon as the place of meeting for 1876. Several members, he said, had proposed Lyons, where there had formerly existed a technical society in connexion with gas industry, and they had expressed a hope of being able on the occasion of their next annual meeting, to bring together the managers of the various gas-works in that part of France.

The proposition was carried unanimously, and the sitting then closed.

The afternoon sitting, which was devoted to the reading of papers and communications, was held at two o'clock—M. MALLET presiding.

The PRESIDENT opened the proceedings by stating that, immediately after the morning sitting, a meeting of the committee had been held, at which the following gentlemen were appointed officers for the ensuing year:—

President.—M. Emile Vautier.
Vice-President.—M. Eugène Lebon.
Secretaries.—MM. Albert Ellissen and Lucien Brémond.
Treasurer.—M. Charles Foucart.

The PRESIDENT then read the following paper—

ON THE THEORY OF THE PURIFICATION OF GAS BY OXIDE OF IRON.

All those who are occupied in the manufacture of gas are aware that oxide of iron is employed in purification for the purpose of absorbing the sulphuretted hydrogen. In France the oxide of iron generally employed is that obtained by treating protosulphate of iron (green vitriol) with hydrated lime.

By this treatment hydrated protoxide of iron is produced, which is of a greenish-black colour, and on contact with air quickly passes into the state of sesquioxide, which is only a mixture of protoxide and peroxide of iron. The lime combines with the sulphuric acid, forming sulphate of lime, sawdust also being generally employed to divide the oxide of iron, and render the mixture more permeable to the gas.

The action of the sulphuretted hydrogen contained in the gas has not, up to the present time, as far as I am aware, given rise to any controversy. It is admitted on all sides that the hydrogen of a part of the hydrosulphuric acid combines with a part of the oxygen of the sesquioxide, which is thus brought back to the state of protoxide, sulphur being deposited.

The protoxide of iron, both that proceeding from the reduction of the peroxide and that pre-existing in the sesquioxide, combines with another portion of the sulphuretted hydrogen of the gas, producing sulphide of iron, which is hydrated.

As the gas, on its arrival in the purifying vessels holding the oxide of iron, mostly contains ammoniacal salts, and especially carbonate of ammonia, there is formed, by double decomposition, sulphate of ammonia and carbonate of lime.

When the oxide of iron purifying material is withdrawn from the purifiers, it is exposed to the atmosphere, when a reaction, due to the presence of oxygen, takes place; the material changes from the black colour due to the hydrated sulphide of iron to the red colour, and is then able to perform again its purifying functions, revivification having been effected.

What chemical reaction takes place in this revivification? It is here that disagreement begins, as much among theoretical as among practical chemists. Some of these gentlemen, and among them is M. Dumas, admit that the hydrated sulphide of iron produces sulphur and oxide of iron; others think that only a part of the sulphur undergoes this transformation, and that the other part passes into the state of protosulphide of iron. M. Cahours goes farther than that. He says, in his "Treatise on Chemistry," that the whole of the sulphur passes into the state of sulphate. Clegg, in his "Treatise on Coal Gas," admits that a small part of the sulphur is transformed into sulphate, especially when the gas contains ammonia. In support of both hypotheses more or less con-

clusive reasons might be adduced; but, as a solution of the question may be arrived at by direct experiments, I have thought it more simple to have recourse to them.

Two modes of proceeding present themselves to view, in order to arrive at this solution.

We can submit to the action of the gas some oxide of iron purifying material, prepared in the ordinary way, taking care first to ascertain the quantity of sulphuric acid it contains; then ascertain the quantity of free acid contained in the material after it has purified a tolerably large volume of gas. If the quantity of sulphuric acid has not augmented, it is because in revivification all the sulphide of iron has been transformed into sulphur and oxide of iron; if the quantity of sulphuric acid has augmented, it is because sulphur, in a larger or smaller quantity, has passed into the state of sulphate.

The other method is more simple—in this sense, that it does not require any test to be made for sulphuric acid. It consists in submitting to the action of the gas oxide of iron completely exempt from sulphuric acid. If in this condition oxide of iron that has served for the purification of gas and been revivified does not contain sulphuric acid, it is because no sulphate has been formed during revivification.

This is the plan I adopted. Into a solution of the chloride of iron of commerce I poured a solution of chloride of barium until precipitation would no longer take place. I then treated the solution, filtered from sulphate of baryta, with pure carbonate of soda.

The precipitate obtained, which was simply oxide or carbonate of iron, contained, therefore, no sulphuric acid. I then mixed it with sawdust, and placed it in a small experimental purifier, through which, for several days, gas coming direct from an ordinary gas-works, and consequently containing ammonia, had been passing. This material was several times revivified.

The liquor obtained by the washing of the revivified purifying material with the distilled water gave, on the addition of chloride of barium, a copious precipitate of carbonate of baryta, consequent upon the presence of carbonate of ammonia in the purifying material.

This precipitate was treated with water acidulated with nitric acid, and submitted to a temperature approaching 100° Cent. Under this action it was entirely dissolved, whence I am led to believe that it contained no sulphate of baryta, and that no sulphuric acid had been formed in the act of revivification; but the addition of the acid gave rise to a liberation of gas, the odour of which disclosed the presence of sulphurous acid. I ought to remark that sulphurous acid combined with a base may be transformed into sulphuric acid on contact with the air, especially in the presence of moisture.

This sulphurous acid may have been produced by the distillation of coal, an operation which in certain conditions is capable also of engendering sulphuric acid; but sulphate of ammonia being a salt that is tolerably soluble, and of but slight volatility, it ought, according to my view, to precipitate during condensation, and be dissolved when the gas is submitted to the operation of washing in the scrubbers.

Sulphite of ammonia is more volatile, and is capable of offering greater resistance to condensation and washing.

In the case in point the condensation was very good, the gas was submitted to a double washing, first with ammoniacal liquor, afterwards with clean water. The sulphate of ammonia which might have been produced during the manufacture of the gas should have been condensed, and the result of the analysis shows that such, in fact, was the case; but the sulphite of ammonia remained—a conclusion to which I am led from the liberation of sulphurous acid.

From my experience I think I may conclude that the revivification of the oxide of iron does not produce sulphuric acid; and that if any of this acid should be found in material that has served for purification, it is because it proceeds from the distillation of the coal, or else is due to the action of the oxygen in the air upon the sulphite of ammonia that the gas has brought with it.

As will be seen, the solution of the problem is not so simple as at first sight it appears, and necessitates long and connected researches. It is my intention to continue this study, and to communicate to you on another occasion the results obtained, if they should be found to be worthy of your attention.

M. Ellissen remarked that tar was not the only obstacle in the way of the revivification of the purifying material. In several trials that he had made upon this material, in which there were no traces of tar, he had found that as soon as the proportion of the sulphur passed a certain figure, revivification no longer took place. He supposed that a sulphide was formed which had not yet been defined, and which did not become revivified when brought in contact with the air.

M. Mallet said he had obtained purifying materials containing as much as from 40 to 50 per cent. of sulphur. The augmentation of the proportion of sulphur appeared to play a mechanical part, and to diminish the purifying power of the oxide of iron material, which was generally composed of oxide of iron, sulphate of lime, and sawdust. Probably by a series of revivifications and sulphurations, a more or less complex sulphide might be formed, upon which oxygen might have less action.

M. Eichelbrenner called attention to this fact—that, in works where the temperature of the retorts was not very high, he was able, with a cubic mètre of oxide of iron purifying material, prepared in the ordinary way, to purify 20,000 cubic mètres of gas; while in works where a high temperature was kept up—at Montreuil, for instance—he could only purify 12,000 cubic mètres with the same quantity of material.

M. Mallet said the fact might be easily explained. The quantity of sulphuretted hydrogen liberated was so much greater the higher the temperature employed, and that was brought about by the decomposition of the pyrites, which do not decompose when the temperature is too low.

M. Eichelbrenner observed that, generally speaking, the first appearance of naphthaline in gas-works took place in the purifiers. He had noticed a very abundant deposit of it on the insides of the purifier-covers.

M. Ellissen said that fact was explained by the elevated temperature produced in the purifier by the revivification, which vaporized the naphthaline, and this condensed on the cold portions of the apparatus. It was not extraordinary, however, that more naphthaline should be produced at Montreuil than in the other works referred to by M. Eichelbrenner, since that gentleman admitted that the temperature employed in distillation was much higher there, naphthaline being produced in much larger quantities when the coal was submitted to a very high heat.

MM. Chamon and Eichelbrenner cited various interesting facts in connexion with the production of naphthaline, the latter gentleman stating that in a particular case he had localized the naphthaline by facilitating its deposition in a spot determined upon, by means of a bundle of iron wire.

M. Jordan confirmed what had been said by the previous speaker as to the predisposition of naphthaline to crystallize in the presence of a foreign body, round which it accumulated. Referring to the presence of sulphur in coals, he remarked that it was interesting to know what quantity they contained, as well as the condition in which it was found. He cited the case of lignites, which, containing only from 10 to 12 per cent. of sulphur, could not be employed in the manufacture of illuminating gas, and it had, therefore, been necessary to give them up. Sulphur was not found combined with iron in the state of pyrites, since no trace of it was given by analysis. The water from the trenches of these mines deposited some white matters—perfectly white sulphur—which would seem to indicate the presence of an alkaline polysulphuret. The lignites to which he had referred were those coming from the Upper and Lower Alps. Their yield of gas was satisfactory, and its illuminating power superior to the standard adopted in Paris. The proportion of sulphur was very large in the rich bituminous lignite of Manosque and Volx, and less in the poor lignite. But the most striking fact was the deposit of sulphur found in these mines, which appeared to be closely analogous to that obtained by exposing an alkaline polysulphuret to the action of the air.

M. Ellissen had found sulphur in the state of sulphate of lime in coals. These various facts made it very desirable that further inquiries should be made as to the state in which the sulphur was found in some particular coal. The proportion of sulphur was certainly a useful and even indispensable piece of information in the selection of coals. It was now, however, of quite as much interest to know in what state the sulphur was found.

The President, in closing the discussion, said that the remarks made by the various speakers led to the conclusion that the presence of sulphur in coals, and the several reactions to which it gives rise (such as the formation of sulphuretted hydrogen, sulphide of carbon, sulpho-carbonates, sulpho-cyanhydrates, sulphites and sulphates of ammonia, and the production of free sulphur), made it desirable to fill up the gaps now existing in this study. He, therefore, invited the members to pursue their researches, at the same time promising to continue his own, a portion of which he had just had the pleasure of bringing before them.

M. Foucart then read the following communication

ON THE COAL SUPPLY.

I am about to occupy your attention with a question of great importance to our industry—viz., the question of the supply of coal. Since the war the price of coal has undergone considerable fluctuations. First of all it rose in an extraordinary manner, the entire output, which had previously been obtained at from 12 to 13 francs at the pit's mouth, reached the price of 32 to 33 francs. Happily these very high figures have not been maintained; good gas coals are, however, still sold at the rate of from 18 to 20 francs in Belgium, and from 20 to 23 francs in the north of France.

I am about to examine with you the causes of this continuous rise in price, to call to your minds the injury we may sustain in consequence thereof, and finally to give you my opinion as to what steps we ought to take to induce the owners of mines to return to reasonable terms.

Cause of the Rise in Price.—You remember that as soon as tranquillity was established after the war and the events following it, manufacturing operations were resumed with extraordinary activity. The whole of that part of the commercial world which obtained its supplies from France, and particularly from Paris, had exhausted its stores, and it was therefore necessary to replenish the stock of the many articles which are produced in this country only.

Besides this, our railway lines, as well as the machinery in connexion therewith, had been very much damaged, not only by our own military transports, but also, and chiefly, by those of the German army, who had made free use of the rolling stock, but had neglected to keep it in proper repair; so that metallurgy was also called upon to furnish its products for the reconstruction of bridges, the relaying of rails, and the replacement of engines destroyed or carried away by the victors.

These several industries were, therefore compelled to increase their demands on the coalowners for fuel; but as the latter had been unable, during the whole of one winter, to obtain a sale for their output, they had reduced it to the limit of the probable demand, so that the stock was soon exhausted. Seeing the position in which things stood, the workmen thereupon resolved to profit by the opportunity thus afforded them for demanding an increase of wages and a reduction in the hours of labour. Everybody recollects the strike that occurred at the Anzin Mines—a strike that would have spread into all the coal basins had it not been for the energetic intervention of the Government, of which M. Thiers then had the direction.

Nevertheless, the coal companies, being unable to meet the demands made upon them, began by refusing to pledge themselves beyond a certain production; and persons engaged in those industries where a supply of fuel was absolutely necessary—whether in consequence of having engagements to fulfil, as in the cases of blast furnaces and gas-works, or to conduct manufacturing operations which it was impossible to postpone, such as sugar refining—being unable to obtain, either in France or in Belgium, or even in England, all the coal they required, went themselves to the mines and offered higher prices. There was a sort of outbidding going on among buyers, until at length the rise assumed quite exaggerated proportions. In the presence of these high rates, certain foreign coal companies imagined they would be able to free themselves from contracts entered into before the rise took place; but I must say, to the honour of our country, that the French coal merchants have all scrupulously carried out their contracts; and I am happy to be able here to award them a testimony of my esteem, in which, doubtless, you will all join.

The price having once taken this upward course, every one was eager to yield to the demands of the coal companies. The mere appearance of a buyer in the square at Mons was sufficient to send up the price of coal 3 francs from one day to another, and in this way the exorbitant prices I just now referred to were reached. Fortunately for us these prices have not been maintained. Industry has sought to create new relations, and certain foreign coals, which were before unable to compete with those of English and Belgian extraction, on account of distance, have been able to come upon our markets under more favourable conditions. A slight reaction in prices has, therefore, taken place, and although quotations have not returned to reasonable rates, they have taken a position midway between those of 1869 and those of 1872.

Prejudicial Effects on Gas Industry of the Advance in Price.—It is unnecessary for me to dwell upon the loss entailed upon gas companies by so great a difference between the prices of coal when their lighting contracts were entered into, and those which now threaten to become established. It is evident that the net cost of the gas we make is now very much higher, yet we have no right to advance the selling price, that remaining unalterably fixed by our contracts; and with regard to the price of coke, I think I ought here, in the name of every gas manufacturer, to protest against the opinion expressed by certain companies, that we are recuperated for any advance to which we may have to submit in the purchase price of coal, by the higher price we obtain for the coke we sell.

We all know that 1000 kilogrammes of coal produce 17 or 18 hectolitres of coke, a part of which we employ for heating the retorts, so that there are about 10 or 11 hectolitres left for sale. Now, as coal is worth at the present time 10 francs per 1000 kilogrammes more than it formerly was, the coke would have to be sold at the rate of one franc more per hectolitre, in order to reimburse ourselves for this greater value. Who amongst us could raise the price of his coke in that proportion?

I will not, however, say that those large companies which had long contracts, entered into before the war, may not have been able to obtain that result; but when their contracts have expired they will find themselves in a similar position to that we occupy, and will submit to the common law.

Steps to be taken to obtain Coal at a reasonable Price.—There is every reason for supposing that the coal companies have judiciously employed the profits they have made during the last few years in increasing their means of production by sinking fresh pits, and that with an increased output they will become more reasonable in the future. At all events, I am about to consider with you what are the best means to be employed to induce them to make a reduction in their prices.

As I informed you when explaining the cause of the recent advance, it is the consumers themselves who have caused the sellers to run up their prices, by outbidding each other in the endeavour to procure their necessary supplies of

fuel. The coalowners were thus enabled to agree among themselves to keep up prices, and even now they regulate their output so well to meet actual demands that they contrive to keep no stock. They ought, nevertheless, to make sure of disposing of the quantity they do produce, and as English coals have fallen to a certain extent, in consequence of the termination of the strikes, or rather the inability of the trades unions to sustain them, they will be compelled, sooner or later, to return to the reasonable prices to which I just now referred.

To this movement help is, I think, afforded by our association, which, by bringing us together every year, and creating between us relations which no spirit of competition is able to disturb, allows us to come to a mutual understanding on this matter, and to group ourselves into districts, each having its centre of supply. For each of these districts a syndicate might be formed to undertake the purchase of our coals. A gas company consuming only 1000 or 1500 tons is too small a customer to be worth the notice of a large coal company; but if by combining together we could go to them with an offer for the purchase of 10,000 or 20,000 tons, and could threaten to take our order elsewhere, we should be listened to, and acceptable conditions would be made. I need not say that, the more numerous we are, the more important our orders will be, and the greater the consideration we shall meet with.

I have only spoken of the coals of good quality from the department of the Nord or from Belgium; the prices of those from the centre and south of France are probably different. The basis of the question is, however, in all cases the same, and we are all, as coal consumers, obliged to submit to the law of the stronger. Let us, then, for the future unite to resist it.

One word, in conclusion, upon English coals, and upon the means of turning them to our use in bringing the continental mineowners to better terms. As I told you, a very sensible reaction has taken place in the price of coal in England, and, by making rather large purchases, and allowing the coals to be loaded on steam vessels, they may be obtained on trucks at Dunkirk or at Calais at prices rather under, or at any rate equal to, those of the Pas de Calais. Business has been done lately at 18 and 20 francs.

Now, it is well known that the Northern of France Railway has a tariff in common with the Lyons and Orleans Railways, which carry coals at the same price, whether they come from Dunkirk or Calais, or even from any of the stations in the department of the Pas de Calais, the Nord, or from the Belgian frontier. I therefore advise those companies who have been unable to renew their contracts, or who have not succeeded in obtaining coal at 20 francs, not to reject offers of English coal. I need not add that, for gas-making purposes, these coals are quite equal, in the yield of gas and coke, and in the quality of these two products, to the best French and Belgian coals.

M. JORDAN heartily concurred in the remarks contained in the concluding portion of M. Foucart's communication, observing that English coals offered certain advantages over those from France and Belgium, the price of which was still very high.

M. ELLISSEN called the attention of those members whose proximity to the coal-pits of the Ruhr (Dusseldorf) enabled them to economically employ the coal from that basin, to the superiority of that material in point of quality, and to the very moderate prices at which, in certain cases, it might be obtained.

M. FOUCART remarked that it was a question of carriage.

M. MALLET said the charge for the conveyance of coals was very high on the line of the Ceinture (Inner Circle), which had only one tariff, whether for coal or more costly material, and all the appeals that had been made to that company, with the view of obtaining a reduction in the tariff, had been unsuccessful. Probably the construction of the line of the Grande Ceinture (Outer Circle) might bring about a diminution in the net price of coal. He believed it was to their common interest to take such steps, each in proportion to his connexion and influence with members of the National Assembly, as would ensure that the tariff to be imposed on the Grande Ceinture line should press as lightly as possible upon the gas industry, and that the tax upon ordinary trains should, if practicable, be repealed.

M. EMILE LEBON hoped that individual efforts would be attended with good results. He, nevertheless, submitted a proposition, which the meeting readily adopted, that the committee should take this question into consideration in the name of the society. A commission would be formed, which would present to the proper parties a full report on this interesting question, and in the name of all the members express their desire to see the gas industry relieved from those heavy burdens which might bring about its ruin, since the taxes on transports had augmented, the price of coal had doubled, while that of gas had remained, and must remain, the same.

M. VÉE informed the meeting that in a fresh treaty recently concluded with the town of La Rochelle the price of gas varied, according to a sliding scale, with the price of coal. It would be desirable at the present time that an analogous clause should be inserted in every fresh treaty.

M. BEGLET at Corbeil, M. EMILE LEBON at Gisors, and M. EICHELBRENNER had made agreements under similar conditions. The only difficulty was to fix the average price of coal which was to serve as the starting-point for regulating the price of the gas. (At Corbeil the price of gas is 30 centimes per cubic mètre when the net price of coal is under 40 francs per ton. At Gisors the price is 43 centimes when coal is under 35 francs per ton. On the terms of the fresh treaties just cited, for a variation of 5 francs per ton in the price of coal, the price of gas varies 0·2 c. per cubic mètre. These figures are given as examples.) But was it necessary to exercise this power of raising the price of gas when there was an advance in the price of coal? One member had done so, and the consumption immediately decreased 15 per cent. It was therefore with extreme caution that they ought to make use of the new clause proposed to be inserted in lighting contracts.

(To be continued.)

BONE GAS.—At the annual meeting of the River Plate Pressure Meat-Preserving Company, Limited, held on Friday, the 27th of August, at the London Tavern, Mr. Alfred Ogan, the secretary of the company, reported that, having been sent to South America to organize the company's works at Bopicuà, he was in a position to state "that a large portion of the factory is now lighted with gas (200 lights) manufactured on the works from the bones of the animals slaughtered, and that before leaving Bopicuà some trials were made of the practicability of heating the retorts by gas, as done in England. These, although not concluded, were exceedingly satisfactory so far as they had proceeded. Should this plan of heating be adopted, a great saving in the cost of coal will result." Mr. Ogan, in the course of his explanation to the meeting of the working of the company's property, said that there was an abundant supply of gas for the lighting of the factory produced from the bones of the cattle. He believed that they were the first persons who had, in South America, made gas from bones. When the works were being lighted up with that gas for the first time, an old butcher was looking on, and he said to a companion, "I have killed many hundred animals, but I never supposed they had stuff like that in them." Considering that it was the first time in South America that gas had been manufactured from the bones of animals, Mr. Ogan thought the company ought to be looked upon as the pioneers of a new industry. So far as the company were concerned, they had already derived great advantage by the saving in the item of expenditure for oil. The chairman of the meeting, Mr. Robert Charles, also referred to the matter as being, in his opinion, not only advantageous to the company, but also as being important from a scientific point of view.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There has been a little more firmness in the price of pig iron during the week just ended, doubtless owing to the stiffness which has characterized both the Scotch and North of England markets in this respect during the same period. Some of the local producers of this material have asked for and obtained a shilling or so per ton advance on actual sales, and have expressed themselves unwilling to bind themselves for any length of time henceforward, unless at clearly higher figures. It cannot, nevertheless, be said that the actual demand for the time being is sufficiently ample to warrant any material rise in prices, the firmness being doubtless attributable to the facts I have already cited, as well as to the continued comparative dearness of ores, fuel, and labour. As these now stand, it is impracticable to make pig iron at lower prices than now, indeed not a few producers are carrying on the operations of their blast furnaces with the merest possible margin of profit. Meantime the current rates quoted by the agents for north Yorkshire firms for G. M. brands are these: No. 1 foundry, 56s.; No. 2 foundry, 53s.; No. 3 foundry, 51s.; No. 4 foundry, 48s.; No. 4 forge, grey, 47s.; No. 5 forge, mottled, 46s. 6d.; No. 6 forge, white, 46s.; refined metal, 68s., Kentledge, 56s.; and cinder pigs, 40s., all per ton for net cash. The Low Moor Iron Company have lowered the price of their celebrated iron to the extent of £2 per ton, as regards boiler plates, and £1 off bars. This leaves the one £24 10s., and the other £21 per ton. Other descriptions of bar iron are as yet unchanged in this respect. The brassfounders are now said to be so well employed, that they are unable to obtain workmen to carry on their operations as fully as they desire. The run is chiefly upon the class of goods enumerated by me in these "notes" several times recently.

The coal trade is still remarkably quiet, the prices realized for several classes of coal being lower than during the three past years. Steam coal of the best quality is about 11s. to 11s. 6d. per ton, other qualities of the same class range downwards to 7s. Gas coal is obtainable on contract at 9s. 6d. to 11s. per ton; but I hear it rumoured that large and long-dated (few coalowners are, however, willing to bind themselves down for more than six months) contracts can be placed at even less than the lower of these limits. The colliers wages question is in an unsettled condition, and appears likely to result in a dispute, if the masters resolve to have the reduction they have already requested from the men.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Business in the local iron trade has this week been most unsettled, owing to the sudden break-up of the Conciliation Board, in consequence of the refusal of the men to accept the award of the arbitrators with regard to the payment of extras. At a special meeting of the trade held at Birmingham on Thursday last, under the presidency of Mr. Hunt, of the New British Iron Company, it was resolved, after much deliberation, to maintain puddlers wages at the rate fixed on the 9th of August—viz., 9s. per ton, and to leave individual firms to settle with their men on the question at issue. An effort is being made to reconstruct the Conciliation Board on a new basis; but inasmuch as the operatives have rejected the decision of their own tried and faithful representatives, it is difficult to see what useful purpose can now be served by such an institution.

Very little work has been done at the mills and forges throughout the district since last report; but there is little doubt that the prospect of a prolonged dispute with the men, and consequent stoppage of operations, has had the effect of bringing out a fair sprinkling of orders, and prices are firm at late rates.

There is no change to report in the pig market. Prices remain so unremunerative that there is no probability of more furnaces being relighted at present. The weekly output of pig iron in the South Staffordshire and East Worcestershire districts is now 5000 tons below the usual average of recent years, many local makers preferring to leave their works altogether idle than submit to current rates for their produce. Meanwhile other districts are profiting by the restricted production here, as large quantities of iron continue to be imported into this market.

In coal there is a somewhat improved demand for best thick and household qualities; but the commoner classes of fuel are still slow of sale, and stocks are gradually accumulating. In the Cannock Chase district best household qualities are also in better inquiry, and the prospects of business for the ensuing season are, on the whole, encouraging. Coal was discovered on Thursday last on the estate of the Cannock and Huntington Colliery Company. After boring for about two years, and overcoming the peculiar difficulties presented by the overlying strata in that district, the Diamond Rock-Boring Company, to whom the work was entrusted, have at length come upon a bed of coal 5 feet thick, at a depth of 435 feet, which leaves no doubt that the other measures of the district will be found in the usual order. The property of the company comprises 1000 acres of the estate of Lord Hatherton, and the importance of the discovery, both to his lordship, and to the district, cannot well be estimated.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is a trifle better feeling in the coal market here, and more confidence with regard to prices, consumers having apparently given up the expectation of any further reduction, at least this year. The demand, however, is not generally active, and the production is still below the average, many of the pits continuing on short time, and to this restricting of the get it is mainly due that prices have been maintained as they have been. There is rather more demand for house coal, which will increase as the month goes on. For manufacturing fuel, however, there is still only a dull inquiry, owing to the unsettled state of trade generally. In the Manchester market prices are the same as last month, with a tendency to firmness.

The probable early settlement of the strike in the cotton trade is giving a more encouraging tone to the coal trade of the Oldham district, but business there is still very depressed, and stocks of engine fuel are accumulating.

In the West Lancashire districts there is generally a steady tone, and August prices are well maintained, the pit quotations for this month being about as under:—Arley coal, 13s.; Pemberton four feet, 11s; Wigan four feet, 9s.; Wigan five feet, 8s. to 8s. 6d.; burgy, 6s. 6d. to 7s.; slack, 4s. 6d. to 5s.; and common slack, about 3s. 6d. per ton.

With regard to gas coal, the buying season for home requirements is about closed, and only very few orders are now coming to hand. The best classes of gas coal have been tolerably well sold, but of common descriptions there is plenty still on offer. The average pit prices in the Manchester district are about as under:—Screened round gas coal, 11s. to 12s. and 13s. per ton, according to size; unscreened, 7s. to 8s. per ton; gas nuts, 8s. to 9s., and cannel, 18s. to 19s. per ton. A fair amount of shipping in this description of coal is, however, being done.

The coke trade continues very dull, and there is a decided weakening tendency in the market, the demand having been steadily falling off during the last few weeks.

In the shipping trade there is still very little doing, and there is a good deal of competition for the few orders in the market.

In the iron trade, although rather higher prices have been asked during the

past week for Middlesbrough pig iron, there is still only a limited amount of business transacted, and only pressing orders are being given out. Lancashire pig iron remains without any change from the prices last quoted, and in manufactured iron quotations are nominally unaltered.

Only half the furnaces in the Wigan district are at present in blast, and the forges are but poorly supplied with work.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

We have now entered the second week in September, and a fair idea may be formed of the prospects of the coal trade of the North of England during the autumn months. They cannot be very satisfactory to the coalowners. It was anticipated that, as the long nights began to draw on, the general trade—at least, of the household and gas trades—would become very much firmer. Such is not the case. It is quite apparent to every one now that the condition of the coal trade of the North of England very much depends on the state of the local industries. The state of the Durham and Cleveland iron trades is no better, nor is it likely to be for some time. The demand for manufacturing coals is very much below the production of the pits. Second-class Durham coals of all kinds are pressed into the market. They are offered at irregular prices, and the effect of this state of trade is that the coal trade generally is considerably depressed, though there are undoubtedly more orders in the market. North country coals are likewise subjected to a good deal of competition from German and French collieries in the foreign markets, and the sale of first-class steam coals has been checked during the past fortnight.

The arrivals in the northern coal ports have been fair. Handy colliers have been in demand for the Thames, at from 6s. 3d. to 6s. 6d. per ton. Rates to the English ports of the British Channel have been from £7 10s. to £8; to the Irish ports, £9 to £10 per keel. The home business from the Baltic and Black Sea is very poor, and more money has had to be paid to steamers to load coals for Cronstadt. But it appears absolutely certain that freights, during the next two months, will still continue to favour shippers, and very little upward reaction may be anticipated.

In the Cleveland iron trade there has been a fair inquiry for pig iron. Makers have kept pretty stiff in their quotations. The finished iron trade is very dull. The plate trade is also far from active. There is a very fair demand for pipes and foundry iron.

The general manufacturing trade of the Tyne is a trifle firmer. Stocks of chemicals have got down, and makers are indisposed to sell at present quotations. The shipments abroad are chemicals, merchants iron, and fire-clay goods. There is no improvement in the iron shipbuilding trade. The coke trade is also quiet.

The labour market is undisturbed at present. There is an abundance of pitmen at the collieries; all the large works are well stocked with labour, but there is nothing in excess.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The annual meeting of the Sanquhar Gas Company was held a few days ago. From the annual statement of accounts read by the treasurer, a profit was shown upon the past year's transactions, from which it was agreed to pay a dividend of 5 per cent. on the whole stock, preference and ordinary, carrying a small balance over. It was likewise agreed to reduce the price of gas to 10s. per 1000 cubic feet. The affairs of the company are now in a more prosperous condition than they have been for several years.

It has been resolved by the directors of the Moffat Gas Company to reduce the price of gas from 8s. 4d. to 7s. 6d. per 1000 cubic feet, as from Sept. 1. This is the second reduction since the beginning of the present year, prior to which the price was 10s. per 1000 feet.

Owing to the resolution of the North British Railway Company with regard to the price of gas at Burntisland, as mentioned in my "Notes" last week, there has been awakened amongst the townspeople a determination to have gas-works of their own. Numerous property owners and ratepayers in the town are signing a petition to the Town Council requesting that body to take steps either to acquire the existing gas-works, or promote the erection of new works.

The Glasgow Corporation gas accounts were under consideration at a meeting of the Town Council last Thursday. A long statement was submitted by Mr. Walls, who moved the adoption of the Gas Committee's minutes. It was recommended by the committee that the price of gas should be reduced from 5s. 5d. to 5s. per 1000 cubic feet, the reduction to be retrospective, and to take effect as from the date of the last survey, and continue up till the 30th of November next, when the price will again fall to 4s. 7d. per 1000 feet. The committee also recommended that in the future no discount shall be allowed on the gas accounts. Bailie Collins objected to the abolishing of the discounts hitherto given to large consumers, and showed that the manufacture of gas at the new works at Dawsholm was costing about three times as much as at the Dalmarnock or Tradeston works. On the suggestion of the Lord Provost, it was resolved to adjourn the discussion of the gas accounts for a week.

A meeting of the Dundee Gas Commissioners was held on Wednesday, when it was resolved to extend the gas-mains in Broughty Ferry Road, a number of requisitionists having guaranteed to take the gas for a period of five years at the rate of 1s. per 1000 cubic feet higher than that charged in Dundee. The manager reported that the amount of coal carbonized during July was 732 tons 6 cwt.; the gas made being 8,255,500 cubic feet.

The value of the gas stock of the Annan Gaslight Company may be judged of when it is mentioned that five shares were sold privately a few days ago at £9 per share, the original cost being only £5 per share.

A committee was recently appointed by the Police Commissioners of Dingwall for the purpose of considering as to the propriety of getting a water supply from Loch Ussie, about three miles distant from the town. The committee have since visited the loch, and made a minute examination of the bottom and shores. They also took specimens of the water for analysis. The estimated expense of the proposed water scheme is £1200.

The operations in connexion with the Dalry Gravitation Water-Works are making rapid progress. The contractors have completed the pipe-laying throughout the water district, and by way of testing the tightness of the pipes, the water is now allowed to pass through them. Operations will henceforth be confined to the completion of the reservoirs and filter-beds, which will yet occupy several weeks.

Loud complaints are still being made in many places in Scotland regarding the scantiness and bad quality of the water supplied to them. At Burntisland, which is one of the places, there is a talk of introducing the Camilla scheme, which was long ago rejected by the town of Kirkcaldy; but there seems to be little prospect of anything being done, and the Board of Supervision may have to step in and insist on action being taken. Forfar is in a somewhat similar plight. One of the officers of that board recently visited Forfar, and drew up a report upon the subject of the inadequate water supply and unhealthy condition of the drainage.

There seem to be some difficulties in the way of the Dundee Water Commissioners. They wish an official test to be applied to the pipes which have been laid, but the contractors refuse to make any further test, as they think such a course would be attended with danger; and the commissioners engineer, Mr. Stewart, considers that the mains have been sufficiently tried, and that it would appear as if they had no further confidence in him if they demanded any further test. The commissioners have resolved to give the contractors six days to carry out the testing, failing which they will themselves undertake it at the contractors risk.

There is nothing new of any importance to report regarding either the iron or coal trades. From 64s. 3d. to 64s. 6d. is the week's closing quotation for warrants. The demand for most varieties of coal is slack in the Glasgow district, and generally throughout the west of Scotland.

RIPON (CORPORATION) GAS-WORKS.—At a meeting of the Ripon Town Council on Thursday last, Mr. Robert Darney, jun., Faversham, late manager of No. 4 station of the Dublin Gas Company, was elected manager of the Ripon Corporation Gas-Works.

SOUTH ESSEX WATER-WORKS COMPANY.—The half-yearly meeting was held on Tuesday, the 31st ult., at the offices in London—Mr. A. Smee, the chairman, presiding. The secretary having read the notice convening the meeting, the chairman moved a resolution declaring a dividend for the half year ending the 30th of June at the rate of 5 per cent. per annum, which was seconded and carried unanimously.

BRYMBO WATER COMPANY.—The annual meeting was held on the 31st ult.—Mr. Robertson, M.P., in the chair. The directors reported that the total expenditure on capital account amounted to £18,467 7s. 5d., being £91 7s. 5d. in excess of receipts from shareholders. The revenue account showed a balance of £500 17s. 8d. available for dividend. Out of this amount the directors recommended the payment of a dividend for the half year at the rate of 5 per cent. per annum, which absorbed £460 10s., and left a balance of £40 17s. 8d. to the credit of next account.

FATAL ACCIDENT AT THE IMPERIAL GAS-WORKS.—On Friday evening last Mr. Langham held an inquest at St. George's Hospital respecting the death of John Ryen, aged 24 years, a labourer lately employed at the Fulham works of the Imperial Gas Company. The evidence showed that the deceased on Monday last was engaged in painting a scrubber. He was sitting on a chair suspended from a pole about 30 feet from the ground, when the pole suddenly gave way and he fell to the ground and was killed almost immediately. It was supposed that the deceased, in pulling himself up the tower by a pulley, loosened the lashings of the pole. The jury returned a verdict of "Accidental death."

BARNSTAPLE WATER COMPANY.—The half-yearly meeting of this company was held on Monday, the 30th ult.—Mr. W. Hunt in the chair. The directors report stated that the aqueduct at Blackpool Bridge had been reconstructed, and they hoped the improvement would prove satisfactory. The accounts for the half year ending the 30th of June showed a balance in the treasurer's hands of £652 19s. 1d., a sum which might appear to justify the declaration of a higher dividend than heretofore; but they did not recommend a dividend exceeding 9s. per share, which would leave a balance sufficient to cover the cost of the new culvert. The report and dividend recommended were adopted, and the meeting closed with a vote of thanks to the chairman.

NEWPORT (MON.) WATER COMPANY.—The half-yearly meeting was held on Monday, the 30th ult.—Mr. Homfray in the chair. The statement of receipts and expenditure on the capital and revenue accounts, for the half year ending the 30th of June last, was reported to be satisfactory. The directors recommended that the guaranteed interest on the preference shares be paid, and that a dividend of £4 per cent. for the half year upon the ordinary capital be declared. They had reason to believe from their engineer's reports that the reservoir and works at Pant-yr-eos were proceeding satisfactorily. Resolutions were adopted dealing with the payment of interest and dividend. The chairman said the reservoir, which would hold 120 million gallons, was 20 acres in extent. The work was being well done, and would perhaps be ready in 12 months.

CROMER (NORFOLK) GAS AND WATER WORKS.—The estimates of Mr. J. Hodgson Jones, for the necessary buildings and plant to supply this town with water, amount to a sum of less than £7000, including the cost of about two miles of mains. Mr. Hodgson Jones reports as the result of his personal examination that an ample supply of pure water can be obtained by boring into the chalk on the proposed site, which has been obtained from the lord of the manor, Mr. J. Bond Cabell, who is also one of the promoters of the undertaking. A gas company for the supply of the town was started in December last, with a capital of £10,000, in 2000 shares of £5 each. It is stated that although unexpected difficulties occurred in the obtaining and selection of a freehold site, the contractor's works are now in full progress, and likely to be completed by the middle of October.

WAKEFIELD GAS COMPANY.—The fifty-seventh half-yearly meeting of this company was held on Monday, the 23rd ult.—Dr. Wood in the chair. The balance-sheet showed that the company had paid for coals and carting, £3490 4s. 7d.; salaries and wages, £1741 1s. 3d.; rates and taxes, £545 3s. 11d.; and tradesmen's accounts, £959 3s. 11d.; and that they had received for gas, meter rents, and fittings £8576 4s. 4d.; coke sold, £1330; tar, £847 12s. 10d.; ammoniacal liquor, £503 1s.; and estimated loss, £100. The liabilities were £7054 2s. 1d.; and the credits, £11,310 8s. 10d.; thus leaving a balance (the half year's profits) of £4256 6s. 9d. The directors report was adopted, and dividends of 10 per cent. on the old shares and 7½ per cent. on the B shares, for the half year ending June 30, were declared, which would absorb £3278 7s. 6d., leaving a balance of £977 19s. 3d. The company have £4000 invested in the Lancashire and Yorkshire Railway Company. The retiring directors and auditor having been re-elected, the proceedings terminated with a vote of thanks to the chairman.

KING'S LYNN GAS COMPANY.—The ordinary half-yearly meeting was held on Friday last—Mr. John Thorley in the chair. The report of the directors stated that whereas the earnings for the year ending June 30, 1874, amounted to £660 odd, for the present year to that date they amounted to £1889 odd. The directors recommended the following appropriation of the earnings:—Dividend at 3½ per cent. paid February last, £560; dividend at 4½ per cent. to be now paid, £720; carried to the reserve-fund, £609 17s. 6½d., giving a total of £1889 17s. 6½d. The chairman moved the adoption of the report, and congratulated the shareholders upon their improved position, which he hoped would continue. Mr. Thew seconded the motion, which was unanimously adopted. Mr. Bagge proposed that a dividend at the rate of 4½ per cent. be paid, this being double the amount paid the previous 12 months. This proposition was also carried. A vote of thanks was accorded to the chairman, who rejoiced in their improved position, and assured them that the proposals now carried had the full approval of their largest shareholders.

NORTH CHESHIRE WATER COMPANY.—The twenty-third ordinary half-yearly meeting of proprietors was held in Manchester on Friday, the 27th ult.—R. Johnstone, Esq. (of Bowdon), in the chair. The notice convening the meeting having been read by the secretary (Mr. H. Barratt, A. Inst. C.E.), the directors report (of which the following is a summary) was adopted:—"The directors have again great pleasure in placing the accounts for the past half year before the proprietors. The revenue account shows a satisfactory result. The directors recommend the payment of the usual dividend of 10 per cent., and the remainder to be carried to the credit of the ensuing half year. The new reservoir at Bowdon is perfectly tight, and has conduced to greater economy in the supply of water and better pressure in the company's district. The length of mains has been increased by 1305 yards of 3-inch pipes, making the length of mains now laid 64⅛ miles." The retiring directors, Messrs. W. Sharp and W. Nash, and auditor, Mr. C. H. Chadwick, were re-elected, and a unanimous vote of thanks was given to the chairman, and also to the directors and officers, for their attention to the interests of the company.

TESTIMONIALS TO MR. M. BROADHEAD, OF GREAT GRIMSBY.—The following resolution was laid before the shareholders by the directors of the Great Grimsby Gas Company, at the half-yearly meeting, on Thursday, the 26th ult.:—"The directors regret that, through ill health in the winter season, Mr. Broadhead has been compelled to resign his duties as manager and engineer to the company. In consideration of his honesty and fidelity as manager, extending over 23 years, your directors have presented him with £100 for his past services, and have also appointed him assistant engineer to the company, at a salary of £60 per annum.' The clerks and workmen also presented Mr. Broadhead with a piece of plate, consisting of a hot water kettle and salver, bearing the following inscription:—"Presented to M. Broadhead, Esq., as a token of respect, by the clerks and workmen of the Great Grimsby Gas Company, June 30th, 1875, on his retiring as manager." The presentation was made by the foreman, he being the oldest servant in the service of the company, and was feelingly acknowledged by Mr. Broadhead, who was seven years in the service of the Leeds New Gas Company before going to Grimsby.

REDUCTIONS IN THE PRICE OF GAS.—The directors of the Swansea Gas Company have resolved to reduce the price of gas by 3d. per 1000 cubic feet, the reduction to take effect from and after the 1st of October. The price of gas to the town of Swansea will be 3s. 9d., and to the Local Board of Health 3s. 6d. per 1000 cubic feet after that date. At South Shields notice has been given that the price will be reduced 3d. per 1000 feet, with the usual discounts, to take effect from the 1st of June last. The directors of the Falmouth Gas Company announce a further reduction of 5d. per 1000 feet from the 29th inst., which, with the discount, makes the net price 4s. 10½d. At Hastings notice has been given of a reduction to 4s. 7d. per 1000 feet within the borough boundary, which is to take effect after the present year. At Wrexham, although the Provisional Order obtained by the company empowers them to charge an increased price of 8d. per 1000 until November next, it has not been found necessary to take advantage of it, and the directors accordingly announce that the price is reduced to 4s. from the 30th of June last. At Sunderland a reduction of 3d. is announced, to take effect from next quarter. The reductions which are made north of the Tweed appear from time to time in our "Trade Notes from Scotland."

LONGTON GAS COMPANY.—The half-yearly meeting was held on Monday, the 30th ult.—Mr. W. Webberley in the chair. The secretary and manager (Mr. J. M. Darwin) read the following report, which was adopted:—"Your directors, in presenting to the shareholders the following statement of accounts, have to report that the business of the company continues to progress satisfactorily. The bill promoted in Parliament by the company during the past session, for the extension of their limits of supply, and for other purposes, received the Royal Assent on the 13th of May last, with the price of gas proposed by the company unaltered. Your directors have entered into contracts for the necessary pipes to extend the supply of gas to Blyth Bridge, and the work is proceeding. To meet the expenditure required, your directors propose to call up the remaining £5000 of the unissued ordinary shares. An agreement has been entered into by the Town Council and the company for the sale of the undertaking to the corporation, upon the terms agreed upon at the extraordinary general meeting held for the purpose of confirming the sale. Your directors recommend that a dividend of 10 per cent. per annum on the original shares, and 7 per cent. per annum on the first and second issue of ordinary 7 per cent. shares, all free of income-tax, be declared at the half-yearly general meeting."

CAMBORNE WATER-WORKS COMPANY.—The sixteenth half-yearly meeting was held on Thursday, the 26th of August.—Capt. W. Rabling in the chair—when the following report was presented:—"The directors have much pleasure in informing the shareholders that they are still able to report progress; some important additions have been made to the number of customers on the company's books, and although the extreme dulness of the times has necessitated many removals from the district supplied by the company, their revenue has not suffered any material loss, but increased. There has been an abundant supply of water during the summer; the capabilities of supply have not been severely tested during the season, owing to the heavy rainfall, but the directors are pleased to find that the leak through the cross-course at the bottom of the reservoir, which has, as the company are aware, caused them some considerable anxiety and expense, has, as the result of their efforts, still the appearance of improvement. The filter-bed below the reservoir has done good service, but now requires cleaning, which will be done during the autumn, the cost of which will be very trifling. The directors regret that a claim has been made on the company by the engineers, which they, in the interests of the shareholders, cannot admit. The works are, generally, in an efficient condition, and are capable of extension beyond their present limits, should it be required." From the accounts it appears the expenditure on capital account to the 30th of June last was £17,962, as against receipts of £13,591, leaving a balance of £4371 to be provided for. The income for the half year was £438 7s., giving a profit of £145 16s. 11d. It was resolved that the report and accounts be received and adopted. The claim of the engineers was left entirely to the discretion of the directors, and an extraordinary meeting of the shareholders is to be called within a month, to discuss the propriety of placing shares held in trust by the company at a reduced rate, to fix the price, and make such conditions on the transfer as may be considered necessary.

Register of New Patents.

3511.—JONES, G. H., Great Russell Street, Bloomsbury, and WHITE, R. G., West Brompton, "*An improved method of and apparatus for lighting and extinguishing gas-lamps by galvanic and electro-magnetic influence.*" Provisional protection only obtained. Dated Oct. 13, 1874.

This invention consists of a stop-cock or tap with sliding plunger or plug, horizontal movement; attached to each end of the plug are soft iron plates which act as armatures for two electro-magnets so arranged as to attract one or other of the plates as occasion requires, to allow the gas to escape to the burner or to shut it off. A single wire with platina point emits a spark sufficient to ignite the gas; one battery serves for the three wires employed. This invention is most applicable to street gas-lamps, as a large number can be lighted simultaneously from a central office or works.

3525.—KIRTLEY, J. G., Monkwearmouth, "*An improved filtering apparatus especially adapted for domestic and ships use.*" Patent dated Oct. 14, 1874.

This invention has for its object the speedy and efficient filtration of water for domestic use, for which purpose two or more cylinders containing the filtering medium are placed upright, side by side, and suitably connected with each other. The filtering material is kept in its position by diaphragms of finely perforated sheet metal or other permeable material near the extremities of each cylinder. At the bottom of the cylinder in which the water from the supply first enters, a flexible tube is connected and fastened by any suitable means to the service-cock; but this tube is of sufficient length and so adapted as to allow of it being disconnected from the first cylinder, and connected to the cock fitted near the bottom of the last cylinder, and from which the filtered water flows. This makes the apparatus self-cleansing, for the water taking a contrary course carries with it the refuse left by previous filtrations. At the top or bottom of each cylinder is a screwed cap for the admission of the filtering material.

3545.—JOHNSON, R., Bradford, "*Improvements in machinery for exhausting and propelling air, gas, and other fluids and liquids.*" Provisional protection only obtained. Dated Oct. 15, 1874.

This improved machinery consists of a right and left handed screw fixed on the same axle, and revolving in a cylinder, the ends or sides of which are open or partly open. The blades of the screw do not join in the centre of the cylinder, but each blade terminates in a straight part forming a parallel channel between the screws; into this channel a tongue fixed to the cylinder enters. There is another opening in the centre of the cylinder corresponding to the channel where the two screws meet.

3549.—HAMILTON, J., Smethwick, "*Improvements in direct-acting pumps worked by steam or compressed air.*" Patent dated Oct. 15, 1874.

This invention relates to the valves of the steam or compressed air cylinders of pumps, and consists in automatically working the valves in the following manner:—The valve consists of three parts, two short pistons at opposite ends of the steam-chest, and a cylindrical hollow valve, with two ports in it, between the short pistons. By the reciprocating motion of the middle valve its ports are made alternately to convey steam to or permit of the escape of exhaust from the same end of the cylinder. Two small ports near the ends of the steam cylinder open into the steam-chest, and admit steam at the proper times behind the end piston valves. As the steam piston makes its stroke, it opens one or other of the small ports, and steam entering the steam-chest acts upon the end piston valve, and the latter advances the middle cylindrical valve and reverses the position of its ports, the entering steam forcing in opposite directions the middle valve and end valve so as to completely open both the steam and exhaust ports.

3567.—ASHWORTH, G. and E. Manchester, "*Improvements in steam-pumps or pumping-engines.*" Patent dated Oct 17, 1874.

According to this invention ram pumps are made double-acting by employing a single ram which works in two ram chambers, each provided with a gland or stuffing-box.

3583.—MURDOCH, H. H., Staple Inn, London, "*Improvements in treating and utilizing spent tan and obtaining useful products therefrom.*" A communication. Provisional protection only obtained. Dated Oct. 17, 1874.

According to these improvements the spent tan is dried and carbonized in retorts in a suitable furnace, the gas evolved in the process being purified and refrigerated, and separated from its tar and other impurities by being made to pass through purifying apparatus, and is finally discharged into a holder or gasometer. The drying and carbonizing process in the retorts is promoted by a blast of air from a fan, which blows away the vapours emitted by the tan, or the vapours may be drawn out by suction, and the tan may be stirred up during the process by a revolving agitator, which may also serve to convey the blast into the retort.

3611.—LACK, P. J., Westmoreland Place, London, "*Improvements in valves for regulating the supply of gas, and in other fittings connected with gas-burners.*" Patent dated Oct. 20, 1874.

This invention has for its object the construction of fittings to be applied to, and used in connexion with, gas-burners, to render the same more economical, with regard to the consumption of gas, and more generally efficient and convenient.

The invention relates, first, to a valve for regulating the quantity of gas admitted to the burner. This valve is formed by a peculiar construction of the burner-tube, which is provided with a screw-thread, whereby it is attached in the ordinary manner to a pipe or arm of a chandelier or bracket, but instead of having a plain straight core forming a direct passage to the burner, it is closed by a disc, which would completely cut off the gas from the burner but for a small or fine perforation, or a number of such perforations, through it. Above this perforated disc the tube is formed with a socket or chamber, wherein is fitted a small nozzle, in which the burner tip is screwed, and which also carries the gallery for supporting the globe or chimney. This nozzle is fitted to turn partially around in the tube, and its lower end is also closed with a perforated disc. The perforations in the two discs must not be in the centre, so that when the discs are fitted together by turning the nozzle the perforations in the disc of the latter can be brought opposite or in line with those of the other disc, and then there will be a free passage of the gas to be burner; or the nozzle can be adjusted to bring the solid part of its disc over the holes in the other disc, and then the gas will be cut off; or the apertures of the nozzle may be so adjusted to those of the tube as to cut off the gas only partially, so that it will be consumed very slowly at the burner. A stop is provided to prevent the turning of the nozzle too far round in its socket. The turning or adjustment of this regulator is most conveniently effected by means of the gallery.

This part of the invention is modified to adapt it to the construction of what are termed sunlight burners as follows:—The burner is made of two rings or annular portions. The lower ring is connected to the supply pipe or tube, and the upper ring is attached to the lower ring by a central screw or by other means which will permit the adjustment of the upper upon the lower ring. The gas issues from the circular slot or division between the two rings, and by adjusting them nearer together or farther apart the size of the flame may be regulated as desired.

Other parts of the invention relate to a contrivance for securing the glass globes or chimneys upon the galleries of the burners, and to the means for supporting a shield or disc for arresting or confining the smoke of the burner.

3620.—CLARK, A. M., Chancery Lane, London, "*Improvements in apparatus for cutting screw-threads on tubes, rods, or other articles.*" A communication. Patent dated Oct. 21, 1874.

This invention relates to a portable machine for cutting screw-threads on tubing, rods, bolts, or similar articles, and consists of a vice for holding the tube stationary and an arm or brace supporting the mechanism for cutting the thread, mounted on a bed-plate fastened to a bench or other support. The diesare fixed to the face of a cog-wheel revolved by suitable mechanism, and are fed forward as the work advances by the hub on the cog-wheel working on a stationary feed-screw fixed on the article under operation.

3641.—HORNE, R. R., Glasgow, "*A new or improved refractory or fire-resisting material which may be used for the construction of retorts and other articles having to resist the action of heat, the same being also applicable as a hydraulic cement.*" Patent dated Oct. 22, 1874.

The invention consists in mixing and combining by water ground gannister, otherwise known as galliard, or fire-stone, with ground fire-clay, quartz, slag, or sand. The material so produced may be formed into retorts or analogous articles by pressing it into moulds, after which they are consolidated by firing, drying, or heating, accordingly as it is desired to vitrify the surface of the artisles or not. In place, however, of using the compounds to form articles by moulding, it may be covered over the surfaces to be rendered refractory as a plaster or cement, and ordinary fire-clay or iron retorts are covered both internally and externally by or with it, or if broken the plaster or cement may be used for repairing the same. It may also be applied to those parts of boilers which are acted upon by the fire, or to the steam space of boilers.

The proportions of the substances constituting the compound may be varied according to the quality of the gannister, galliard, or fire-stone, the quantity of slag or sand used being from 15 to 50 per cent.

The invention also includes the construction of retorts and analogous articles from ground gannister, galliard, or fire-stone alone, mixed with water, moulded into shape, and then fired.

3658.—PARKER, T., Birmingham, and WESTON, P. A., Colebrookdale, Salop, "*Improvements in direct-acting pumps worked by steam, compressed air, or water, which improvements may also be applied to motive-power engines.*" Patent dated Oct. 23, 1874.

This invention consists in constructing and working the valves of pumps and

engines in the following manner:—Two exhaust-valves, two steam-valves, and two pistons are arranged on a rod working in a steam-chest furnished with seats for the steam and exhaust-valves. One piston, one exhaust-valve, and one steam-valve are arranged on either side the middle point of the rod, the exhaust-valves being of greater area than the steam-valves. Small ports are made in the ends of the steam-chest, in addition to the steam and exhaust ports, and as the piston approaches one end of the steam cylinder, the small port is opened and steam is admitted to the back of the exhaust-valve and the exhaust-valve at that end is thereby closed and the steam-valve opened, the exhaust-valve at the other end of the steam cylinder being opened and the steam-valve closed. The same action takes place when the steam piston approaches the opposite end of the cylinder. The movement of the valve is produced by the action of the steam on the exhaust-valve, the area of which is greater than that of the steam-valve.

Arrangements are also described by which the admission of steam to the back of the exhaust-valve is regulated, and for working the steam expansively, and giving any desired range of cut-off.

3661.—Hooker, W. D., and Browne, S. G., Kilburn, London, "*Improvements in steam-engines, and steam-regulators attached thereto. Also in pumps and pump-valves worked by said engines.*" Patent dated Oct. 23, 1874.

These improvements consist in the construction of a direct-acting steam-engine working on the compound principle, which will measure its stroke, start at any point in its stroke, and waste no steam in any of its functions. Also in an apparatus for regulating the supply of steam to an engine in an improved pump-valve actuated by a steam-engine, and in a novel means of lining the cylinder of a pump worked by the engine, which can readily be removed and replaced.

3687.—Holman, S., Laurence Pountney Lane, London, "*Improvements in apparatus used in the manufacture of gas.*" Patent dated Oct. 26, 1874.

The first part of this invention consists in the application and use of self-supporting bracketted cross-bars for carrying the lids or doors of gas-retorts, and in providing eccentric hinge fastening with supporting pins to carry the cross-bars and lids, or lids without cross-bars (as the case may be), without the aid of screws or other means of tightening or fastening the eccentric-hinge joint-pins, so as to admit of their being very readily and quickly taken out and replaced.

The second part of the invention consists in the construction and application of vibrating hinged joint lugs to carry the cross-bars and lids above referred to, and in making the same interchangeable with vibrating catches.

The third part of the invention consists in the construction and use of flat cast iron lids without rims, but with centre lugs on each side, so as to serve either as single or reversible retort-lids, by turning the periphery true (and by preference semicircular in form), in such a manner that either side of the turned periphery may effect a sound sealing of the retort by direct contact with a true bevel surface formed in the retort mouthpiece, as described in the specification of Morton's patent, No. 575, Feb. 24, 1869.

The fourth part of the invention consists in the construction of mouthpieces for retorts, provided with recessed or other suitably shaped lugs to receive the vibrating hinged joint lugs, referred to in the second part of this invention, so that the hinged joint lugs may be made interchangeable with vibrating catches, thereby enabling the fastening lever to be placed at either the right or left hand side of the retort mouthpiece.

3699.—Hambleton, F. H., Baltimore, U.S.A., "*Improvements in apparatus to admit of the continuous running of a pump or other apparatus supplying fluid through pipes when the flow through the pipes is for a time wholly or in part arrested, without injury to the pipes and without waste of fluid.*" A communication. Patent dated Oct. 26, 1874.

The object of this invention is automatically to prevent the damage to pipes conveying fluids under pressure, and to prevent waste of fluid when the regular outlet or outlets from the pipe shall be for a time wholly or in part closed, and the pump or other supply apparatus shall continue to run. For this purpose an apparatus is employed consisting of a partially balanced valve in a side chamber on a pipe or channel through which the fluid flows. The valve is held shut, when the regular outlets are opened, by a lever, the end of which extends into the current in the main-pipe. The currents impinging on the end of this lever prevent the partially balanced valve from opening. When the fluid is prevented from escaping at the regular outlets the current is arrested, and the lever loses its power of holding the valve closed, the pressure acting on the unbalanced portion of the valve then opens it, and the fluid escapes through the valve without strain to the pipes, and is conducted into the under side of the suction-valve, where a pump is used for forcing fluid, in which case the fluid will simply circulate through the pump without materially increasing the pressure in the pipe, or the fluid may be allowed to run to waste. When the waste-pipe of the escape is connected to the suction of the pump, and the power of the lever over the partially balanced valve is altered, this alteration, where it is sufficient to interfere with the satisfactory operation of the valve, is compensated for by a spring which can be adjusted to the required tension to counteract the effect of the vacuum over the valve.

3717.—Chandor, J. A., New York, "*Improvements in ignition fuses and in the means for igniting the same, applicable to lamps, gas burners, torches, and other like purposes.*" A communication. Patent dated Oct. 27, 1874.

The essential feature of this invention consists in the use of collodion compounds or their equivalents (such, for example, as are known as xylodine and pyroxyline), by preference in the form of hard strips, coated or covered either over the whole or a portion of their surface with any suitable or well-known friction match composition. The collodion compound may, if desired, be mixed with a resinous or other inflammable or gummy substance of a less combustible nature than collodion, in order that the improved ignition fuse may burn, not only with the degree of intensity required, but for a sufficient length of time to ensure the complete ignition of the combustible substance intended to be ignited. The fuse strips may be moulded or otherwise formed entirely of collodion compound, or the compound may be applied to the surface of any other material to be used as the foundation or base for the fuse, the friction match composition being afterwards applied thereto either by pressure in moulds or otherwise. A coating of collodion may be finally applied over the surface of the match composition to render it impervious to moisture.

The peculiar arrangement for igniting the fuse consists of a tube or holder for its reception; the fuse being elevated as required for use by a ratchet tooth worked by a button handle, such tooth engaging into ratchet teeth cut in the fuse itself. The same movement which elevates the fuse causes a sharp point to scratch the fuse composition, thereby igniting it.

3719.—Paget, F. A., Adelphi, London, "*Improvements in centrifugal pumps for raising and forcing liquids, and in centrifugal pumps or fans for exhausting and blowing gases.*" A communication. Patent dated Oct. 27, 1874.

These improvements consist in guiding or leading the liquid or gaseous fluid gradually into the vanes of the revolving wheel of the apparatus by means of a curved central directing plate, and in shaping the cross section of the directing plate to the curve known in hydraulics as the "contraction curve." The directing plate is made moveable and adjustable, so that the volume of water or air can be regulated or completely shut off from the revolving wheel. In a centrifugal pump for water, such a directing plate is employed as the bottom valve, so that it can be used for filling the pump, while the same can be set up in the outlet main, and the usual outer casing dispensed with. For the revolving portion of the pump and fan respectively a series of cells or enclosed spaces are employed, into which the fluid is gradually led by means of the directing plate. In a centrifugal pump for air, two directing plates are by preference employed, one to each side of the central orifice. The revolving wheel at its outer periphery is fitted with a fixed casing or wheel concentric, and preferably consists of a series of guiding blades or vanes with sides forming cells, by which the velocity of the liquid or the fluid issuing from the revolving wheel is gradually reduced as it flows out of the fixed casing. The concentric wheel or casing may be combined with any appropriate known form of revolving centrifugal pump or fan with or without the directing plate. For a centrifugal pump for water, a diffusion plate is employed, forming the disc connecting the revolving wheel to the boss, keyed on the spindle, with openings so as to equalize the pressure and side thrust on the spindle. This is enclosed in an oil chamber, and made adjustable longitudinally. The spindle is formed so that there can be a supply of oil down its centre, the end of the spindle is recessed and caused to embrace a brass step working on the vertical pivot. The vertical standard in which the pivot is held is also recessed to form a chamber within which the oil is supplied, and the top of the chamber is closed by means of a leather cover, whereby the water is caused to float up the oil between the surfaces of contact of the step brass and the fixed pivot.

APPLICATIONS FOR LETTERS PATENT.

2856.—Butler, G., Southwark, London, "Improvements in ball valves for high or low pressure water service, and for drawing off other liquids." Aug. 13, 1875.

2880.—Paterson, R. O., and Brothers, F. W., Cheltenham, "Improvements in obtaining salts of ammonia." Aug. 16, 1875.

2884.—Wirth, F., Frankfort-on-the-Maine, "Improvements in water-meters." A communication. Aug. 16, 1875.

2888.—Packer, O., Westminster, London, "Improvements in double-slide box cocks." Aug. 17, 1875.

2905.—Duckham, H. A. F., Holloway, London, "Improvements in gas-regulators, more especially applicable for regulating the supply of gas to the burners of railway and tram carriages." Aug. 18, 1875.

2927.—Fletcher, T., Warrington, "Improvements in gas and other furnaces." Aug. 20, 1875.

2930.—Steel, J., Glasgow, "Improvements in drawing retorts, and in the machinery or apparatus employed therefor." Aug. 20, 1875.

2961.—Tongue, J. G., Southampton Buildings, London, "Improvements in rotary steam, air, or gas engines." A communication. Aug. 23, 1875.

2986.—Mallinson, J., Welwyn, Herts, "Improvements in cocks and in sluice and valves to regulate the flow of steam, water, and other fluids." Aug. 25, 1875.

2989.—Dubois, J. L., Clapham, London, "Improvements in cocks or taps." Aug. 26, 1875.

2994.—Beach, H., Brighton, "Improvements in taps known as high-pressure water-taps." Aug. 26, 1875.

3010.—Bonneville, H. A., Paris, "Improvements in the manufacture of gas for lighting and heating, and in the apparatus connected therewith." A communication. Aug. 27, 1875.

3019.—Weyhe, W., Bremen, Germany, "Improvements in motor engines worked by steam, air, gas, or other fluids, also partly applicable as pumps or blowing engines." Aug. 27, 1875.

GRANTS OF PROVISIONAL PROTECTION.

1865.—Morgan-Brown, W., Southampton Buildings, London, "Improvements in photometers." A communication. May 21, 1875.

2539.—Nicholas, J., Manchester, "Improvements in apparatus for indicating the levels of water or liquid in reservoirs and other places." July 15, 1875.

2742.—Bucknill, J. T., Whitehall, and Casella, L. P., Holborn Bars, London, "Improvements in gauges for indicating fluid pressures." Aug. 4, 1875.

2772.—Mills, B. J. B., Southampton Buildings, London, "Improvements in liquid-meters." A communication. Aug. 5, 1875.

2813.—Cherry, H., Birmingham, "Improvements in direct-acting steam pumping-engines." Aug. 10, 1875.

2819.—Lake, W. R., Southampton Buildings, London, "Improvements in gas-burners." A communication. Aug. 11, 1875.

2826.—Hallewell, R., Blackburn, "Improvements in gas motor-engines." Aug. 11, 1875.

2829.—Stevens, T., Berwick, N.B., "Improvements in the treatment or purification of the waste liquids discharged from paper mills and other works, as well as the sewage of towns, and in the modes and means employed therefor." Aug. 11, 1875.

2842.—Sugg, W. T., Westminster, London, "Improvements in apparatus for the storeage and supply of gas." Aug. 12, 1875.

2856.—Butler, G., Southwark, London, "Improvements in ball valves for high or low pressure water service, and for drawing off other liquids." Aug. 13, 1875.

NOTICES TO PROCEED.

1367.—Harries, B., Landport, Portsea, "A new apparatus for gauging the supply of water when used for flushing closets, domestic or other purposes, in order to prevent waste." April 15, 1875.

1368.—Spencer, T., Euston Square, London, "Improvements in the purification of water and other fluids." April 15, 1875.

1599.—Jennings, J. G., Lambeth, and Pocock, A. W., Westminster, London, "Improvements in liquid-meters." April 30, 1875.

1865.—Morgan-Brown, W., Southampton Buildings, London, "Improvements in photometers." A communication. May 21, 1875.

2017.—Crease, J. F., Southampton, "Improvements in the construction of filters." June 2, 1875.

2067.—Key, W., Accrington, Lancs, "Improvements in station gas-governors." June 5, 1875.

2406.—Lyttle, W. A., Hammersmith, London, "Improvements in the means and apparatus for producing animal charcoal and other filtering materials for use as purifiers of liquids and gases, and for reviving or restoring the same when exhausted by use." July 3, 1875.

2539.—Nicholas, J., Manchester, "Improvements in apparatus for indicating the levels of water or liquid in reservoirs and other places." July 15, 1875.

2610.—Warner, W. J., South Shields, "Improvements in machinery and apparatus for charging and discharging gas-retorts." July 22, 1875.

2653.—Howard, T., Norfolk, "Improvements in the purification of gas." July 27, 1875.

2668.—Spikes, J. A. L., Handsworth, Stafford, "Certain improvements in high-pressure steam, water, or other valves." July 28, 1875.

2675.—Hanson, J., Dewsbury, York, "Improvements in the treatment of sewage and in the manufacture of manure therefrom." July 28, 1875.

2685.—Redwood, T. B., North Finchley, London, "Improvements in the manufacture of gas." July 29, 1875.

2725.—Aitken, H., Stirling, and Young, W., Renfrew, "Improvements in the manufacture of illuminating gas and in the apparatus employed therefor." Aug. 3, 1875.

2737.—Imray, J., Chancery Lane, London, "Improvements in cutting screw taps and dies, and in apparatus applicable to lathes for that purpose." A communication. Aug. 3, 1875.

2843.—Anderson, G., Westminster, London, "Improvements in apparatus for the more economical manufacture and supply of illuminating gas." Aug. 12, 1875.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

2843.—ANDERSON, G., Cannon Row, Westminster, "Improvements in apparatus for the more economical manufacture and supply of illuminating gas." Aug. 12, 1875.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

660.—BATES, G., Lewes, Sussex, "Improvements in apparatus for attaching main-cocks, valves, plugs, or other connexions to service-pipes for water when under pressure." Feb. 23, 1875.

668.—NEUHAUS, M., Strand, London, "Improved means and appliances for the production of lighting and heating gas from air and spirituous vapour combined." Feb. 23, 1875.

693.—STORER, J., Birmingham, "Improvements in water-closets." A communication. Feb. 25, 1875.

715.—TROTMAN, S., Stowmarket, Suffolk, "Improvements in the mode and means of generating and inflaming gaseous vapour in lamps or other apparatus containing petroleum, spirit, or other hydrocarbon fluid or highly volatile oils." Feb. 26, 1875.

724.—REYNOLDS, O., M.A., Manchester, "Improvements in apparatus for obtaining motive power from fluids, and also for raising or forcing fluids." Feb. 27, 1875.

770.—CLARK, A. M., Chancery Lane, London, "Improvements in gas-meters." A communication. March 2, 1875.

826.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in traps or apparatus for separating liquids from vapours or gaseous fluids." A communication March 5, 1875.

833.—FARNSWORTH, S, Mansfield, Nottingham, "Improvements in valve apparatus for controlling the passage of water or other fluids." March 6, 1875.

839.—COOKE, J., Durham, "Improvements in the construction of rotary engines and pumps." March 6, 1875.

999.—BROTHERHOOD, P., Notting Hill, London, "Improvements in apparatus for forcing or compressing fluids or liquids." March 18, 1875.

1053.—RAWLINGS, H., Stamford Street, London, "Certain improvements in the construction of filters for the purification of water and other liquids." March 23, 1875.

2320.—BOULTON, M. P. W., Oxford, and IMRAY, J., Southampton Buildings, London, "Improvements in helical pumps." June 25, 1875.

2334.—SMYTH, W. W., Maidstone, Kent, and HUNT, G. G., New Cross, London, "Improvements in gas-engines." June 26, 1875.

2499.—PATRICK, R., the younger, Waterloo, Canada, "Improvements in rotary pumps and engines." July 12, 1875.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

820.—WISE, W. L., Adelphi, London, "An improved continuous horizontal apparatus for washing or absorbing gas or vapours, or for distilling liquids." A communication. March 5, 1875.

1499.—BUCHAN, W. P., Glasgow, "Improvements in ventilating the soil and waste-water pipes and drains of houses, and in the construction and fitting of water-traps or apparatus for the said purpose." April 23, 1875.

1515.—LAWRENCE, J. E., and PORTER, E. V., Westminster, London, "Improvements in combined engines and centrifugal pumps." April 24, 1875.

1581.—GODDARD, B, Southport, Lancs, "Improvements in taps or valves." April 29, 1875.

1712.—HEINZERLING, C., and M'GOWAN, G., Glasgow, "A new or improved process for oxidizing anthracene, and improvements in the colouring matter produced therefrom." May 8, 1875.

2060.—CHRIMES, R., Rotherham, York, "Improvements in hydrants or fire-cocks." June 4, 1875.

2105.—SIMMONS, J., New Cross, London, "Improvements in rotary engines and pumps." June 8, 1875.

2312.—ANDRÉ, G. G., "Improvements in raising or forcing water from mines, wells, or other places, and in apparatus therefor." Aug. 2, 1872.

2324.—GEDGE, W. E., "An improved portable pump." Aug. 3, 1872.

2362.—MYERS, S., "Improvements in gas lighting apparatus." Aug. 8, 1872.

2421.—BLACKHAM, J. J., "Improvements in gas-stoves." Aug. 14, 1872.

2428.—CAWSE, C. H., "Improved apparatus for regulating the supply of water to water-closets and other vessels." Aug. 15, 1872.

2453.—EMMENS, S. H., "Improvements in apparatus for producing heat and light." Aug. 16, 1872.

2460.—LAKE, W. R., "Improved apparatus for automatically igniting gas." Aug. 19, 1872.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2426.—GEOGHEGAN, C., "Improvements in self-acting regulators, and in the cocks or taps to the same, for supplying fluids at high pressure, and preventing the bursting of cocks, pipes, or taps under ordinary circumstances or from the effects of frost." Aug. 1, 1868.

2457.—EDWARDS, E., "Improvements in pumps." Aug. 6, 1868.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

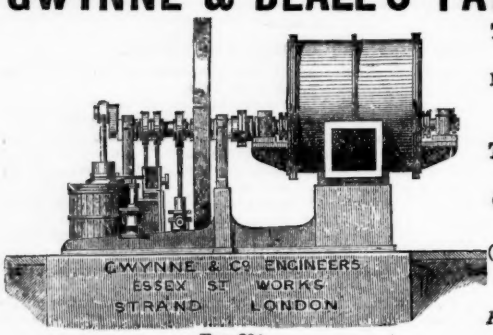


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

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The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

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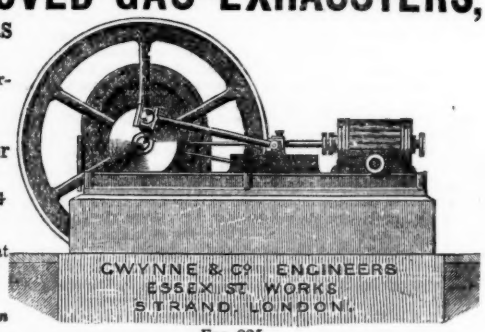

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 800 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

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G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

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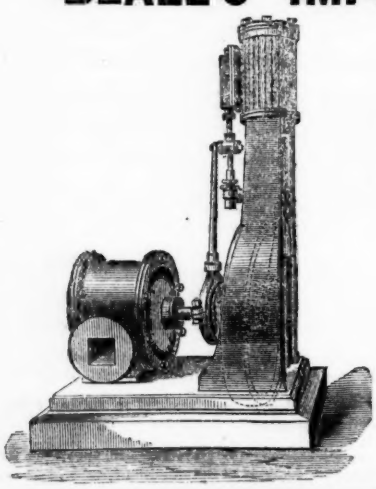

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ENGINE COMBINED

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SOLE MAKERS,

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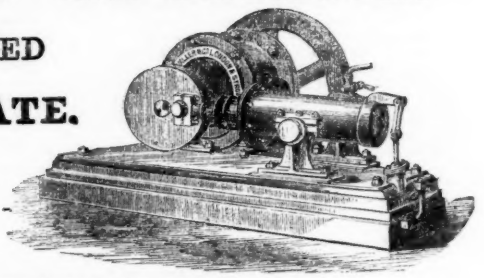
Who, since Mr. BEALE'S retirement, are the Oldest Makers.



EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
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EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

WANTED, an Agency for Gas-Works Contractor, or to manage Gas-Works, mains, fittings, meters, &c., practically. At home or abroad.
Address D. D., Post-Office, REGENT'S PARK ROAD, N.W.

WANTED, a competent Man to take charge of a small Gas-Work in North Wales. Wages 25s. per week, with house, coal, and gas.
Apply, by letter, to Mr. GEO. E. WOODFORD, Secretary, Rhos Gas Company, Limited, near Ruabon, NORTH WALES.

WANTED immediately, at a Gas-Work in the country, a steady and industrious Man as STOKER. Constant employment. Average wages 26s. per week.
Apply to the SECRETARY, Gas Office, Winsford, CHESHIRE.

WANTED, by a thoroughly practical Manager, a similar SITUATION, where the make of gas is not less than 16 millions. Has held the last situation 20 years. First-class testimonials and references.
Address G. B., Post-Office, Ashford, KENT.

WANTED for a Gas-Work near London, a steady Man as STOKER. Constant employment. Must understand the working of an Exhauster and clay retorts. Liberal wages.
Apply, by letter, to No. 194, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, aged 23, a re-engagement as CLERK or Assistant Clerk to a Gas Company. Good knowledge of book-keeping, meters, photometer, and routine of a Gas-Work.
Address W.C., care of Mr. Perry, 1, Church Street, High Orchard, GLOUCESTER.

WANTED, a situation as Manager of Gas-Works. Twelve years in one situation. Thorough knowledge of main and service laying, gas and inside fitting, and setting of retorts, iron or clay.
Address Mr. DONALDSON, 4, Cannon Row, PARLIAMENT STREET, S.W.

TO GAS-MAIN MANUFACTURERS, &c.

WANTED immediately, a small quan- tity of 1½-in. and 2-in. Socket and Spigot Cast PIPES.
Apply to Mr. E. SMITH, Secretary, Droitwich Gas Company, DROITWICH.

WANTED, to Lease a Gas-Works. Highest reference given.
Address Mr. G. DONALD, South Camp, ALDERSHOT.

GAS-WORKS IN THE BRAZILS.

WANTED, an experienced Manager to take charge of Gas-Works in North Brazil.
Apply, by letter only, stating age, experience, salary expected, &c., to PARA GAS COMPANY, Limited, 34, Leadenhall Street, LONDON, E.C.

WANTED, the Management of a Gas- Work, where a day stoker is kept preferred. Understands engine and exhauster, laying mains, services, and fixing meters, &c.; or as an Assistant Manager of a large Gas-Work.
Address No. 191, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT ENGINEER.

WANTED, in a provincial Gas-Work, the services of a gentleman as ASSISTANT ENGINEER. He must be a good draughtsman, and well acquainted with the modern principles of making and purifying gas. Salary £200 per annum.
Apply, by letter, to 193, care of Mr. King, 11, Bolt Court, FLEET STREET E.C., on or before the 20th proximo.
Aug. 24, 1875.

ASHFORD GAS AND COKE COMPANY, LIMITED.

WANTED, a thoroughly practical Man as MANAGER, who understands the manufacture of gas, and will superintend the laying of mains and fittings, and index takings, attend to the resetting of retorts, and generally manage the works and make himself useful. No one but a practical person need apply.
Applications, by letter, stating age and salary required, with testimonials, to be addressed on or before the 18th of September next, to Mr. F. HUGHES HALLETT, Ashford, KENT, the Secretary of the Company.
Aug. 24, 1875.

NEW EDITION, NOW READY,

ADVANTAGES OF GAS FOR
COOKING AND HEATING.
By MAGNUS OHREN, A.I.C.E., F.C.S.
For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

THE Llanelly Gaslight Company desire to secure the services of an experienced practical MANAGER, accustomed to the manufacture and distribution of gas. Present make 17 millions, rapidly increasing.
Apply, stating salary required, to Mr. JOHN POWELL, Secretary, Llanelly, SOUTH WALES.

FOR SALE—A combined Purifier and CONDENSER, with centre change-valve, suitable for 300 lights. Extreme size 7 ft. 5 in. by 6 ft. by 3 ft. 1 in. high.
Apply to the BRYMBO COMPANY, near WREXHAM.

TENDER FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS from parties willing to purchase such TAR as the Company may desire to dispose of for Three years from the 1st of October, 1875.
The Directors do not bind themselves to accept the highest or any tender.
Sealed tenders, endorsed "Tender for Tar," to be sent to me, the undersigned, on or before Monday, the 20th inst.
W. A. PADFIELD, Secretary.
Gas-Works, Exeter, Sept. 4, 1875.

COAL TAR AND AMMONIACAL LIQUOR.

THE Gloucester Gas Company invite TENDERS for all the surplus TAR and AMMONIACAL LIQUOR produced at their works, for a period of One or Three years, as may be agreed on.
Particulars on application to the undersigned.
The Company do not bind themselves to accept the highest or any tender.
R. MORLAND, Engineer and Manager.
Gas-Works, Gloucester, Aug. 27, 1875.

ROCHDALE CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders from parties willing to supply and fix a Telescopic GAS-HOLDER, 100 ft. in diameter and 30 ft. deep, to be completed during the month of August, 1876.
Plans and specifications may be seen on application to the Engineer, Mr. Samuel Hunter, Assoc. Inst. C.E., Gas-Works, Rochdale.
Tenders to be sent to my office on or before the 14th day of September next, endorsed "Tender for Gasholder."
The Committee do not bind themselves to accept the lowest or any tender. By order,
ZACH. MELLOR, Town-Clerk.
Town-Hall, Rochdale, Aug. 26, 1875.

MILTON-NEXT-SITTINGBOURNE GAS-WORKS.

THE Secretary finding it impossible to reply individually to the numerous applicants for the appointment of Gas Manager at these works, adopts this method of THANKING them for their attention, and begs to inform them that a Manager was appointed on the 1st of September.
Milton, Sept. 4, 1875.

THE St. Day Fire-Brick and China Clay Company, Limited, having largely increased their works, are now prepared to TENDER in any quantity for the supply of their well-known BRICKS and other FIRE GOODS, either for the Home trade or exportation. Prices and samples will be forwarded on application to the works, St. Day, CORNWALL, or the London Offices, 7, St. Bene't Place, GRACECHURCH STREET.

THOMAS ALLAN & SONS, of Spring- bank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices

G. A. BAILEY AND CO., Machinists, Manufacturers of all kinds of Indexes for Gas and Water Meters, Indicators, Tell-Tales for Turnstiles, on an improved principle. Every description of Wheel and Worm Cutting, &c.
86, Crampton Street, Newington Butts, LONDON, S.E.
N.B.—Country Orders executed with despatch.

WOLSTON'S TORBAY IRON PAINTS.

THE Torbay and Dart Paint Company, Limited, 23, Great George Street, Westminster, S.W., having been informed that PAINTS not manufactured by them are being offered to Gas Companies and the public as "WOLSTON'S," hereby give notice that they will TAKE PROCEEDINGS against any persons infringing their rights as sole proprietors and manufacturers of Wolston's Torbay Iron Paints.
(See Advertisement on another page.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

MESSRS. JOHN BETHELL & CO.,

(ESTABLISHED 1836,)

CONTRACTORS for GAS TAR,

MAKERS OF ANTHRACENE, CREOSOTE, &c.,

CLAYTON CHEMICAL WORKS, MANCHESTER;
SWAN VILLAGE, WEST BROMWICH.

Head Offices: 38, KING WILLIAM STREET, LONDON BRIDGE.

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PURIFICATION OF ILLUMINATING GAS

BY

SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

TESTIMONIALS SENT ON APPLICATION TO

SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,
VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER;

SOLE MANUFACTURERS OF SPENCE'S PATENT DRY COPPERAS,
SPENCE'S PATENT GAS DEODORIZER, AND MUDIE'S DISINFECTANT;

MANUFACTURERS OF

SULPHATE OF AMMONIA, VITRIOL, COPPERAS, &c.;

PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

D. BRUCE PEEBLES & CO.,

ENGINEERS,

FOUNTAINBRIDGE WORKS, EDINBURGH,

MANUFACTURERS OF WET AND DRY GAS-METERS;

Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,

ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

WARNER AND COWAN'S
SELF-REGULATING GAS-METER,

PATENTED IN

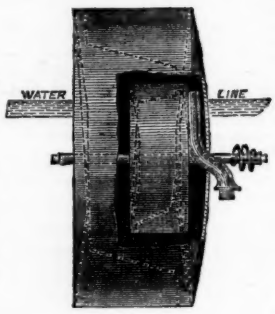
GREAT BRITAIN, FRANCE, AUSTRIA, PRUSSIA, BELGIUM, AND THE UNITED STATES.

OPINION

OF

W. RICHARDS, Esq., London, Inventor of the Dry Gas-Meter.

"Your improvement in the Wet Meter is decidedly the best that has been introduced since its invention; exceedingly beautiful and simple, which renders the instrument mathematically correct, and infinitely more accurate than any means in general usage for the measurement of liquids."



OPINION

OF

WILLIAM MANN, Esq., late Superintendent of the Chartered Gas-Works, Blackfriars, London.

"I saw a model of your Wheel to day,* and certainly think it the best addition that the Wet Meter has received since its invention, to ensure correct registration until the closing of the valve."

* Sept. 8, 1874.

From "THE JOURNAL OF GAS LIGHTING," Jan. 5, 1875.

"The changes effected in the construction of the wet meter are such that it now occupies a position which it never held before—that of an unvarying measure. . . . . Both company and consumer are now equally protected, perfect accuracy of measurement is obtained, and that, too, without the least increase of mechanism, or the action of the meter in the least degree being prejudicially affected."

From "IRON," March 13, 1875.

"The construction of their meter is beautifully ingenious, and of great simplicity. All extraneous compensating arrangements are cast aside, the inventors having boldly attacked the measure itself, making it of fixed capacity in spite of a varying water-level. . . . . Thus this meter is the only one we know of with a fixed capacity. It is more stable in action, from the greater range of float, arising from the greater range of water-level, which the construction gives. Not only in a normal condition, but under varying circumstances, its registration is practically correct."

From GEORGE ANDERSON, Esq., Consulting Gas Engineer, London.

"Found correct at the water-level, and also with 30 and 60 cubic inches of water withdrawn."

Mr. H. SPORNE, Meter Inspector to the City of London,

Referring to the lights, certifies, "Lights in each firm and steady."

Opinion of THOMAS WHIMSTER, Esq., Engineer of Perth Gas-Works.

"When full, with 3 gills run off, and again with 7 gills extracted, the registration did not vary one-quarter per cent. I am thoroughly satisfied with your Meter, and will take the earliest opportunity of giving you an order."

Opinion of B. M. M'CRAE, Esq., Engineer to the Dundee Gas Commissioners.

"Surpasses anything that has hitherto been produced."

BRITISH ASSOCIATION OF GAS MANAGERS, Leeds, 1875. Inaugural Address of the President, JAMES PATERSON, Esq., F.G.S., of Warrington.

"There are, however, degrees of what may properly be termed excellence; and this leads me to notice one of the most beautiful applications which science has yet devised in the construction of the meter, and which has rendered it an absolutely reliable and unvarying instrument. . . . . The object aimed at, and most admirably accomplished, is to change the varying measurement of a varying water-line to an unvarying measure with a varying water-line and annulus."

NORTH BRITISH ASSOCIATION OF GAS MANAGERS, Dundee, 1875. Inaugural Address of the President, G. R. HISLOP, Esq., F.C.S., Paisley.

"While recognizing in the ordinary wet meter a very perfect measuring instrument, when the conditions of watering are fulfilled, all devoted advocates of the wet meter system must hail with real satisfaction an improvement lately brought under our notice, whereby measurement is rendered practically correct under very varying conditions of water level. I refer to the Warner and Cowan New Patent Wet Meter, with which you are already quite familiar. The object of this invention is to secure the seller against loss through negligence or irregularity in the watering arrangements, but certainly not to supersede ordinary systematic watering. I need furnish no further proof of the value of this invention than that of submitting to you the following table of testings of the different sized meters:—

Size of Meter.	Gas per Hour at 5-10ths Pressure.	Indication at High Water Level.	Quantity of Water Extracted.	Indication at Low Water Level.
2 lights.	12 cubic feet.	1 per cent. fast.	5½ gills off.	1 per cent. fast.
3 ,,	18 ,,	1 ,, ,,	6½ ,,	1 ,, ,,
5 ,,	30 ,,	1 ,, ,,	13 ,,	2 ,, ,,
10 ,,	60 ,,	2 ,, ,,	16 ,,	1½ ,, ,,
20 ,,	120 ,,	Net.	36 ,,	Net.
30 ,,	180 ,,	Net.	58 ,,	1 per cent. fast.
50 ,,	300 ,,	1½ per cent. fast.	2¼ gallons off.	2 ,, ,,
60 ,,	360 ,,	...	...	...
80 ,,	480 ,,	...	...	...
100 ,,	600 ,,	Net.	4 gallons off.	½ per cent. slow
150 ,,	900 ,,	1 per cent. fast.	6¾ ,,	¼ ,, fast.

Opinion of Dr. WALLACE, F.R.S.E., F.C.S., Gas Examiner for the City of Glasgow.

"I have no hesitation in saying that it is the most perfect Meter that has come under my notice. . . . . Such extremely accurate performance, combined with such an extensive variation in the quantity of water, leaves nothing further to desire in the measurement of gas."

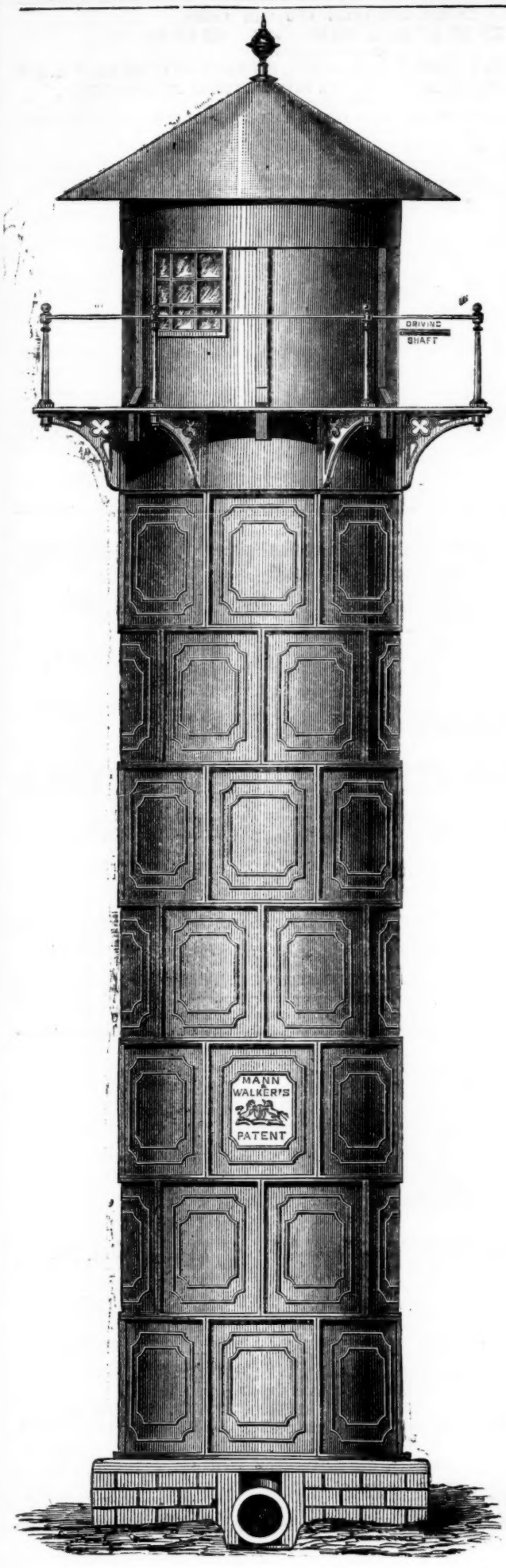
THE ORIGINAL LICENSEES AND MANUFACTURERS:

W. & B. COWAN,

ESTABLISHED 1827,

KING HENRY'S WALK,
BALLS POND ROAD,
(NEAR DALSTON JUNCTION STATION,) **LONDON, N.**

BUCCLEUCH ST. WORKS, EDINBURGH.



C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

The improvements made during the past three or four years in all the parts of the internal and external construction and machinery of these Scrubbers have rendered them perfect for their work of purification with all kinds of coal, and their cost is less than any other method of completely purifying gas from ammonia.

They contain their own motive power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, **nearly one hundred being in use,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

ECCLES, MANCHESTER.

D. M. NELSON,

48, GORDON STREET (late 135, BUCHANAN ST.),
GLASGOW,

Supplies every requisite in connexion with the distribution of Gas and Water.
Estimates and prices on application.
WOOD GRIDS for Purifiers and Scrubbers.
Cast-Iron PIPES and VALVES.
Street LAMP-PILLARS.
Patent Pipe SCREWING-MACHINES, &c.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.
South Shields. W. J. WARNER.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

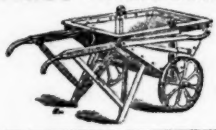
16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine: (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.
J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

BRAY'S PATENT ENAMEL REGULATOR GAS-BURNERS.

We submit the above Burners to Managers of Gas Companies as being worth a recommendation to their consumers. Though the price is little more than that of common Burners, we believe them to be nearer perfection, for general use, than any others, however costly.
By an increasing number of important gas and railway companies they are used as being the best obtainable for general purposes, and have supplanted enormously costly burners, which give good results in the testing-room, but which fail of their effect when brought to the test of general use.
Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner to the City of Glasgow, in a lecture on the "Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow in March, 1874, says: "These are the best Burners obtainable at moderate cost," and, after mentioning several other "good" Burners (which ranged in price up to thirty times the price of ours), he continues, "and their performance is no better than that of Bray's Burners."
Wholesale of our numerous Wholesale Agents.
Manufacturers,
GEORGE BRAY AND CO., BLACKMAN LANE, LEEDS.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

SPENT OXIDE OF IRON.

We are open to
BUY EITHER LARGE OR SMALL PARCELS.
State quantity and price, put free on rails, or delivered here to
JOHN NICHOLSON & SONS, CHEMICAL WORKS, HUNSLET, LEEDS.

PLUTONIC CEMENT.

(REGISTERED.)
Indispensable to the Profitable Manufacture of Gas.
SOLE MANUFACTURER,
WILLIAM RICHARDSON,
CHARLES HENRY STREET & BISSELL STREET, BIRMINGHAM.
Gas Apparatus of all Descriptions supplied Complete and in Detail.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

TO GAS COMPANIES AND THE TRADE.

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MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.
A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.
STREET LAMPS AND COLUMNS IN GREAT VARIETY.
WORKS: LONDON AND BIRMINGHAM.

GAS MOONS,
Cut and Engraved, of the newest designs
GAS REFLECTORS
In Silver and Glass
GAS NIBS
AND
BURNERS
Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.

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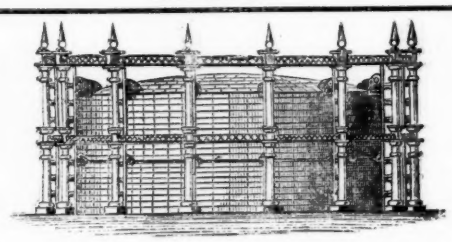
ESTABLISHED 1830.

HOPE IRON WORKS,



STOCKTON ON TEES.

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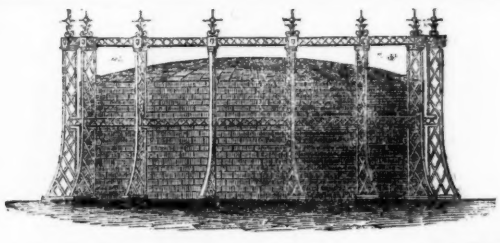
GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.



THE HORSELEY COMPANY,

LIMITED,
TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
6, WESTMINSTER CHAMBERS, VICTORIA STREET,
GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
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ALSO
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MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

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TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

ALFRED WILLIAMS,

PHŒNIX FIRE-BRICK WHARF,

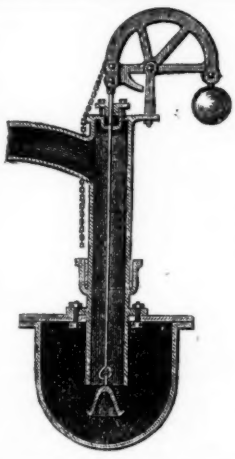
64, BANKSIDE, SOUTHWARK, LONDON, S.E.

GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.



BOX'S

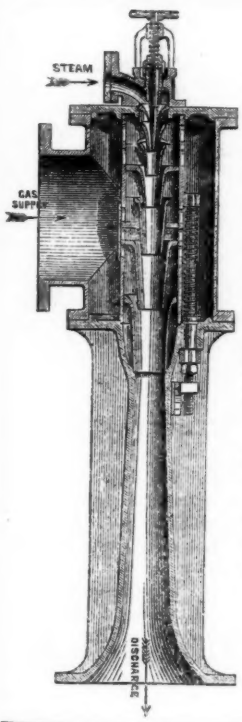
PATENT ANTI-DIP VALVE

Affords a clear gas way through the dip-pipe while the retort is in action, and produces a perfect seal at pleasure, or whenever the retort is open, offering great security against the drawing of air, and obviating the necessity for using any liquid in the now so-called hydraulic main. It is easy of application to existing apparatus, and is comparatively inexpensive. Is not likely to get out of order, as the tar, which will adhere to the botton of the dip-pipe and the flange of the cone, both of which are faced, will act as a lubricant, and prevent undue wear and tear. The whole, as will be seen on inspecting the accompanying illustration, is exceedingly simple, and every part accessible. To adapt it to the present dips, all that is necessary is to face the bottom edge of the dip-pipe, and suspend a cone by a rod, which passes through the bonnet, the raising and lowering of the cone being performed through the intervention of a weighted eccentric.

The Patentee is prepared to supply Patented Apparatus upon the most moderate terms, and will be happy to reply to any inquiries that may by adddressed as under—

W. BOX,

GAS-WORKS, CRAYFORD, KENT



KÖRTING BROTHERS,

SOLE LICENSEES FOR

W. CLELAND'S PATENT STEAM-JET GAS-EXHAUSTER.

E. KÖRTING'S PATENT

STEAM-JET GAS-EXHAUSTER.

Small Cost—Compactness—Perfectly Self-Acting—Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—No Extra Room Required—No Wear and Tear—No Noise—No Oscillation in Vacuum, or Back Pressure.

UPWARDS OF 150 IN USE IN CONTINENTAL GAS-WORKS.

IN ENGLAND SUPPLIED TO–

Chartered Gas Co., London; London Gaslight Co., London; South Metropolitan Gas Co., London; Phœnix Gas Co., London; Liverpool Gas Co., Linacre; Corporation Gas-Works, Bolton; Cornholme District Gas-Works; Epsom and Ewell Gas Company; Horsham Gas Company; Gaslight Company, Ipswich.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS FOR THE PURIFYING MATERIAL.

W. CLELAND'S PATENT STEAM GAS-SCRUBBER,

Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

For particulars, apply to **KÖRTING BROTHERS,**

STEAM-JET ENGINEERS,

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CELLERSTR. 35, HANNOVER, GERMANY.

11, RUE LOUIS-LE-GRAND, PARIS.

222, WALNUT STREET, PHILADELPHIA, U.S.

KÖRTING BROTHERS,

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LONDON AGENT AND AGENT FOR SOUTH OF ENGLAND:

GERALD J. TUPP, 8, John Street, Adelphi, W.C.,

To whom all inquiries for these districts should be addressed.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

SCOTSWOOD-ON-TYNE.

THOMAS LAMBERT & SONS

MANUFACTURE EVERY DESCRIPTION OF

GAS AND WATER FITTINGS;

ALSO,

WROUGHT-IRON TUBES & FITTINGS.

SHORT STREET, LAMBETH, LONDON.

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THE HURST

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Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAY.

Manufacturers for Home and Export.

GAS-RETORTS, GLASS-HOUSE FURNACE, BLAST-FURNACE, & TANK BRICKS, LUMPS, TILES,

And Every Description of Best Fire-Bricks.

"SELLARS' CEMENT"

PREVENTS WASTE OF GAS FROM RETORTS;

SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;

GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;

And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.

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THE GAS CEMENT WORKS,

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WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

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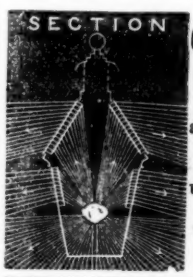


THE PATENT

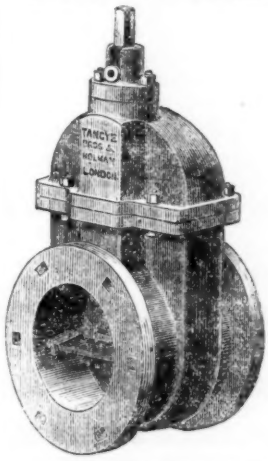
CATOPTRIC LAMP

Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

IMPROVED

GAS-VALVES,



AT GREATLY

REDUCED

PRICES.

Inch.	s.	d
3	25	0
4	36	0
5	40	0
6	54	0
7	63	0
8	80	0
9	85	0
10	100	0
12	120	0
14	140	0

TANGYE BROS. & HOLMAN,

LAURENCE POUNTNEY LANE,

LONDON.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:
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SOLE PROPRIETORS AND MANUFACTURERS OF
WOLSTON'S CELEBRATED
TORBAY IRON PAINTS.
(ESTABLISHED 1851.)

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Waggon Works, and the Paint Trade generally. They are the BEST PROTECTORS of IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to ironwork. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned coloura—ground in best linseed oil, and requiring only before use to be thinned down in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

PRICES and TESTIMONIALS on APPLICATION.
(See Notice on another page.)

WATER-MAINS.
COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.
Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
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BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
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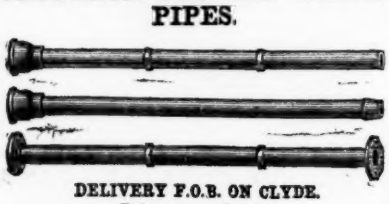
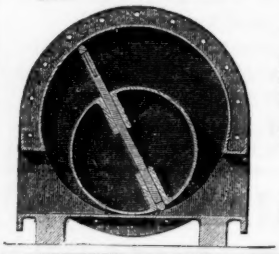


DELIVERY F.O.B. ON CLYDE.
Prices on application.

TRADE MARK J. BEALE'S PATENT GAS EXHAUSTER.

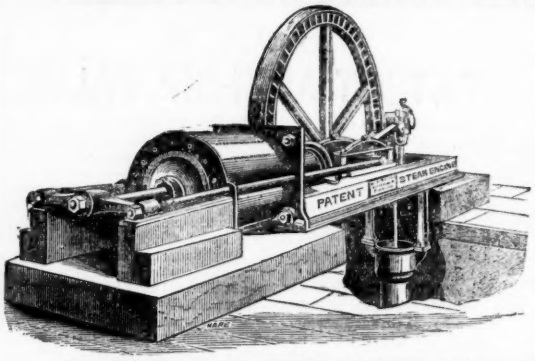


BEALE'S CONTINUOUSLY ACTING
GAS EXHAUSTERS
ARE NOW MANUFACTURED BY
B. DONKIN & CO.

MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.
B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

Estimates and Prices on application to
B. DONKIN & CO.,
ENGINEERS & IRONFOUNDERS,
BERMONDSEY, LONDON, S.E.

ECONOMY OF FUEL IN STEAM-ENGINES.
B. DONKIN & CO.,
PATENT HORIZONTAL COMPOUND CONDENSING
STEAM-ENGINES,
APPLICABLE FOR DRIVING GAS-EXHAUSTERS.

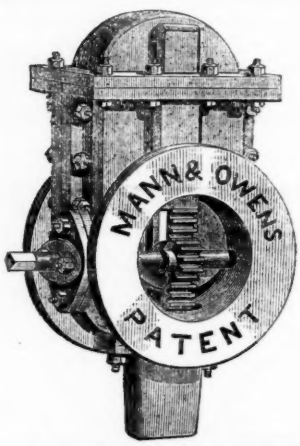


These Engines have been at work a sufficient number of years to prove their durability and efficiency.

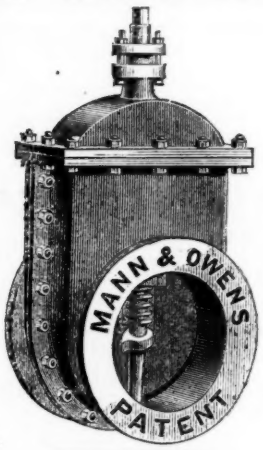
One of them has been subjected to a scientific and exhaustive trial to test the consumption of fuel, with the result that an expenditure of less than **2 lbs.** of coal per hour developed one indicated horse power.

Full Details of this Trial, and Prices, sent on application to
B. DONKIN & CO., BLUE ANCHOR ROAD, BERMONDSEY, S.E.

MANN & OWENS' PATENT GAS-VALVE.



RACK AND PINION VALVE.



SCREW VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:
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HYDRAULIC AND GENERAL ENGINEERS,
WHITEFRIARS STREET, LONDON, E.C.
PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

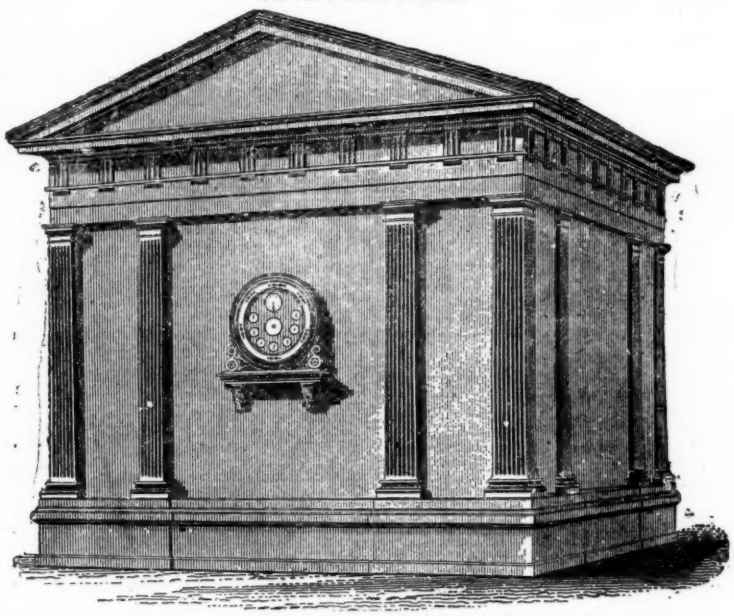
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



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WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

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GAS AND CONSULTING ENGINEER,

4, CANNON ROW, PARLIAMENT STREET, S.W.

Mr. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress of the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan*

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brüner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.

JACKSON, FOX, AND ELLEN,
55, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.

WILLIAM FRASER,

INVERKEITHING,

Owner of the Works at which Fire-Clay Retorts were first made), can supply

RETORTS, FIRE-BRICKS, &c.,

to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

He ships at Charlestown his

CELEBRATED HALBEATH STEAM COALS,

on Navy List.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

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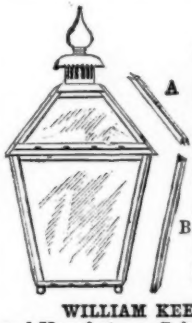
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.



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A KEEN'S PATENT DOUBLE-CLIP

STREET-LAMP.

A great improvement on the old-fashioned 14-in. Lamps.

They have been sold to various Gas-Works throughout

B the country and abroad, and the highest satisfactory testimonials are given as to their superiority.

For particulars of price, &c., apply to

WILLIAM KEEN, Sole Proprietor and Manufacturer, Robertson Street, HASTINGS.

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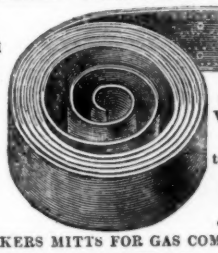
Hose-Pipes and Fire-Buckets,

Canvas Hose,

Sponge Cloths,

Cotton Waste, &c.



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J. HACKETT AND CO.,

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Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

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Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

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Of every description delivered f.o.b. United Kingdom, or cost freight and insurance Abroad, upon lowest terms.

Contracts undertaken for the Shipment, Insurance, and Delivery Abroad of Plant and Materials for Gas and Water Works, &c.

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LESMAHAGOW

MAIN SEAM CANNEL COAL.

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LIMITED,

WYLAM-ON-TYNE.

WYLAM WOOD CANNEL COAL WORKED FROM ABOVE COLLIERY.

Analysis—10,280 cubic feet of gas per ton of Coal, having an Illuminating Power of 26·2 Sperm Candles, and yields 13¼ cwt of Coke per ton of Coal.

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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

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INTERNATIONAL EXHIBITION, 1862.

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For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.

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POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

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The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

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Established 1840.

C. T. GRANT & CO. COAL BROKERS GLASGOW.

Scotch Churls

PRESENT PRICE:

5s. 6d. per Ton at Pit.

8s. 9d. ,, F.O.B.

Cubic Feet.	Illuminating Power.	Coke (sup. qual.).
10,000 ..	20 candles. ..	12 cwt.

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WOOD PURIFIER SIEVES,

Which have now been used for twelve years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their

CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

ALEXANDER & HILL,

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SUPPLY THE BEST

REAL OLD SILKSTONE

GAS COAL & GAS NUTS.

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Supply and Contract for all the principal Scotch Gas Coal (including BOGHEAD, HARTHILL, CHAPELSIDE, LESMAHAGOW, and BRAEHEAD), f.o.b., or delivered at home or abroad.

ENGLISH AND WELSH COAL AND CANNELS ALSO SUPPLIED.

Analyses and Prices on application.

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Bends, Tees, and Irregulars,

AND

GENERAL FOUNDERS.

ESTIMATES and PRICES on APPLICATION.

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STOURBRIDGE.

Delivery per Rail to any Part.

MESSRS. NEWTON, CHAMBERS, & CO.,

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NEAR SHEFFIELD,

STRONGLY RECOMMEND A TRIAL OF THEIR

CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY, LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO

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ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE LOCHORE AND CAPLEDRAE CANNEL COAL COMPANY, LIMITED.

Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: 19, MAITLAND STREET, EDINBURGH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.		Sample worked at Lochore
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	..	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	..	34·83
Value of 1 cubic foot of gas in grains of sperm	780	..	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	..	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	..	71 minutes.
Gravity of the gas (air = 1000)	596	..	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.		Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	..	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	..	33·09
Value of 1 cubic foot of gas in grains of sperm	878	..	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	..	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	..	67 minutes.
Gravity of the gas (air = 1000)	677	..	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

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CROLL'S
DRY GAS-METERS,

PRIZE MEDALS.
LONDON, 1851;
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COMBINING ALL THE LATEST IMPROVEMENTS,

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Of the highest excellence.

STATION-METERS AND GOVERNORS.

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TESTING APPARATUS

Of the most perfect description for all purposes relating to Gas.

"GAS MEASUREMENT AND GAS-METER TESTING," by F. W. HARTLEY, A. Inst. C.E.
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THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
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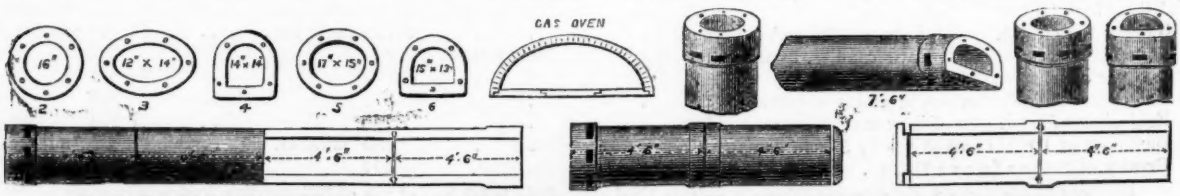

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